CLS Button Position Monitor Sensitivity Analysis

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Canadian Light Source
107 North Road
University of Saskatchewan
Saskatoon, Saskatchewan Canada

	Signature	Date
	Original on File – Signed by:	
Authors	(D. Bertwistle)	2001-11-14
Reviewer #1	(J. M. Vogt)	
Reviewer #1	(N. Johnson)	
Reviewer #3	(E. Matias)	
Approver	(M. de Jong)	

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A	2001-08-29	Original Draft	D. Bertwistle
B	2001-11-03	Revision	D. Bertwistle
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Introduction

Button Position Monitors may be used to determine the position of an electron beam in a vacuum cavity. Accurate modelling of the electrostatic fields of the system allow for the calculation of gain settings that will be used for the Button Position Monitor hardware.

Definitions and Abbreviations

BPM: Beam Position Monitors

EM: Electromagnetic

References

1. Press, W. H. S. Teukolsky, W. Vetterling, B. Flannery 1992.
2. Physics / David Halliday, Robert Resnick, Kenneth S. Krane – 4th ed
3. Beam Position Monitor For The Photon Factor Storage Ring By Tomotaro Katsura and Shinkichi Shibata National Laboratory for High Energy Physics Oho-machi, Tsukuba-gun, Ibaraki-ken, 305, Japan.
4. Beam Position Monitoring by Robert E. Shafer Low Alamos National Laboratory, Low Alamos, NM87545.

Design

Background

BPM's may be used to determine the position of an electron beam in a vacuum cavity. Understanding how the EM fields produced by the beam affect the button position monitors allows for accurate determination of the beam position. A relativistic electron beam travelling through a vacuum chamber will produce electric and magnetic fields that are transverse [3]. Given that the fields are transverse modelling the fields is reduced to a two dimensional electrostatic problem.

Poisson was used to model the electrostatic fields in the vacuum cavity. For the button gain settings, it is only necessary to know the electric field in the region near the surface of the button that is flush with the surface of the vacuum chamber. There are three main steps to doing this.

1. An Automesh input file is created containing the geometry of the cavity, relevant (EM) properties of the system, mesh specifications, the location of the charge and the amount of charge. Automesh program is run and uses the Automesh input file to generate a triangular mesh.
2. Poisson is run and takes the last Automesh run as it's input and generates an output that solves Maxwell's equations for the triangular areas of the mesh.
3. Lastly a Poisson/Superfish postprocessor called 'SF7' is used to interpolate the electric fields at equally spaced points across the button. A simple input file is created for SF7 that gives the two points to interpolate between and the number of intervals between those two points. Each of these files is included in the Appendix. The electric field points are then used to determine the average electric field in the region near the button. This is done for each of the four buttons in the vacuum cavity. The numerically calculated average electric fields for each button are then used to calculate the gain values for each button.

Since Poisson is a command line program an automation routine was written in C++ that creates the Automesh input file, generates a set of beam points and stores them in an array, a beam coordinate is selected from the array and using that point an Automesh input file is created for that particular point. Automesh is run, then Poisson, then SF7. The interpolated set of electric field points above the button is then used to determine the average electric field over each button. The coordinates of the beam and the average electric fields for each button are then stored in text file in tab-delimited format. This is done for each set of beam coordinates. The C++ code has been included in the Appendix.

Poisson tends to pull mesh slightly at points where there is a fixed coordinate such as a beam, it may help to enter in all possible beam positions such that the same mesh is used each time a set of coordinates is cycled through. An example Automesh input file is included in the Appendix. It is consistent with the geometry of the cavity (forced to be symmetric) shown in Fig. 4a and Fig. 4b in the Appendix.

The voltage on a button is proportional to the average electric field across a button, determining the average electric field numerically in Poisson will allow for the calculation of the relative beam offsets via the following Equation for a horizontal offset:

$$X = K_X \frac{V_B + V_D - V_A - V_C}{V_A + V_B + V_C + V_D}$$

$$X = K_X \frac{W_B \cdot \overline{E}_B + W_D \cdot \overline{E}_D - W_A \cdot \overline{E}_A - W_C \cdot \overline{E}_C}{W_A \cdot \overline{E}_A + W_B \cdot \overline{E}_B + W_C \cdot \overline{E}_C + W_D \cdot \overline{E}_D}$$

$$W_A = W_B = W_C = W_D$$

$$X = K_X \frac{\overline{E}_B + \overline{E}_D - \overline{E}_A - \overline{E}_C}{\overline{E}_A + \overline{E}_B + \overline{E}_C + \overline{E}_D}$$

V_B -The voltage induced on a particular button

X - Voltage proportional to horizontal offset

K_X -Gain

W -Constant of proportionality between the average electric field and the voltage

$\overline{E}$ -Average Electric Field

Method of Analysis:

Calculation of the gain values for the hardware calibration points were chosen at beam offsets of 10mm from the geometric centre of the cavity for a horizontal gain (no vertical offset) and for a vertical offset (no horizontal offset). Once these points were chosen then two successive runs of Poisson were done. One run is done for the horizontal offset and another run for the vertical offset. For a single beam position an Automesh input file was generated (properties and geometry of the cavity are the same as the Automesh input file included in the Appendix). After Automesh is run it produces a so-called 'dump', Poisson is then run and it uses the dump as it's input. The electrostatic fields are generated and the output is then 'dumped'. SF7 is run four times, once for each button. Each run of SF7 requires a different input file giving the two points to interpolate between, and the number of intervals between the two points. The results are produced in a file called OutSF7.txt. Within this file is a table containing the coordinates of the interpolated points, the horizontal component of the electric field, the vertical component of the electric field, and the magnitude of the electric field for each interpolated point. The OutSF7.txt file for the 10mm horizontal offset and the OutSFT.txt file for the 10mm vertical offset are included in the Appendix. The vertical electric field components for each interpolated point are extracted from the OutSF7.txt file. For the buttons on the bottom of the cavity the line of interpolation yielded a horizontal component of $E_x \approx 0$, this is consistent with the cavity being in electrostatic equilibrium. For the top two buttons the line of interpolation was taken at .1 mm below the surface of the button because the SF7 interpolation program yielded electric field values ($E_x = E_y = 0$) values that were zero for a line of interpolation along the surface of the button. This is despite the fact that Poisson indicates that there is electric field values not equal to zero in between the surface of the buttons and .1mm below the buttons. In this case at a .1 mm below the button the vertical electric field components were used since it is the vertical electric field that is the field normal to the surface and the vertical components did not vary along a vertical line between the surface of the button and .1 mm below the button. 100 intervals were used in between the two end points of the line of interpolation to obtain the discrete values. Then the equation listed above is applied to the vertical electric field values for each button. The result is then used to calculate the gains for the hardware. This is done for both a vertical and horizontal offset and the exact equations used may be found in the appendix under Eq. 8a and 8b.

Data:

The data below in Table 1 corresponds to the calibration values for the gain settings of the Button Position Monitors. A beam displacement of 10mm from the vertical and the horizontal of the geometric centre of the cavity were used to calculate the values for the vertical gain and the horizontal gain. Fig. 3 corresponds to beam positions forming a square with the geometric centre of the cavity at the centre of the square, the data corresponding to Fig. 3 is in Tables 2-7 in the Appendix. The square has an edge length of 10 mm. Cells that are undefined refer to beam positions where there is a beam offset of zero in the horizontal, vertical or both. The sensitivity calculated for a beam offset of zero will be undefined due to division by an offset of zero. The gain is the reciprocal of the sensitivity and will be zero in the case of no offset. The buttons are labelled A, B, C, and D as shown in Fig. 4a.

Table 1a

Position		Average Electric Field Across Button			
X-(mm)	Y- (mm)	A	B	C	D
34	19	1102.71281	1102.73107	1102.69811	1102.69078
35	19	1027.94852	1176.94938	1027.96944	1176.91883
34	20	1181.23706	1181.29578	1024.60321	1024.59799
44	19	467.22451	1545.21324	467.29569	1545.13377
34	29	1606.40747	1607.71656	380.94155	380.91249
44	29	358.5443	4631.52469	202.68662	450.19867

Table 1b

Position		Displacement From Center			Apparent Offset of Beam	
X-(mm)	Y- (mm)	Horizontal (mm)	Vertical (mm)	Charge Density (nC/cm)	X-(mm)	Y- (mm)
34	19	0	0	1	4.62634E-05	0.000202134
35	19	1	0	1	1.261432195	3.54066E-05
34	20	0	1	1	0.000226403	1.15151772
44	19	10	0	1	10	3.33948E-05
34	29	0	10	1	0.006010545	10
44	29	10	10	1	14.95604984	12.46169111

Table 1c

Position		Sensitivity		Gain	
X-(mm)	Y- (mm)	X (%)	Y (%)	X (V/%)	Y (V/%)
34	19	Undefined	Undefined	0	0
35	19	6.756569106	Undefined	0.14800411	0
34	20	Undefined	7.102233207	0	0.140800783
44	19	5.356268164	Undefined	0.18669715	0
34	29	Undefined	6.16771508	0	0.162134597
44	29	8.01086136	7.686016021	0.124830521	0.130106416

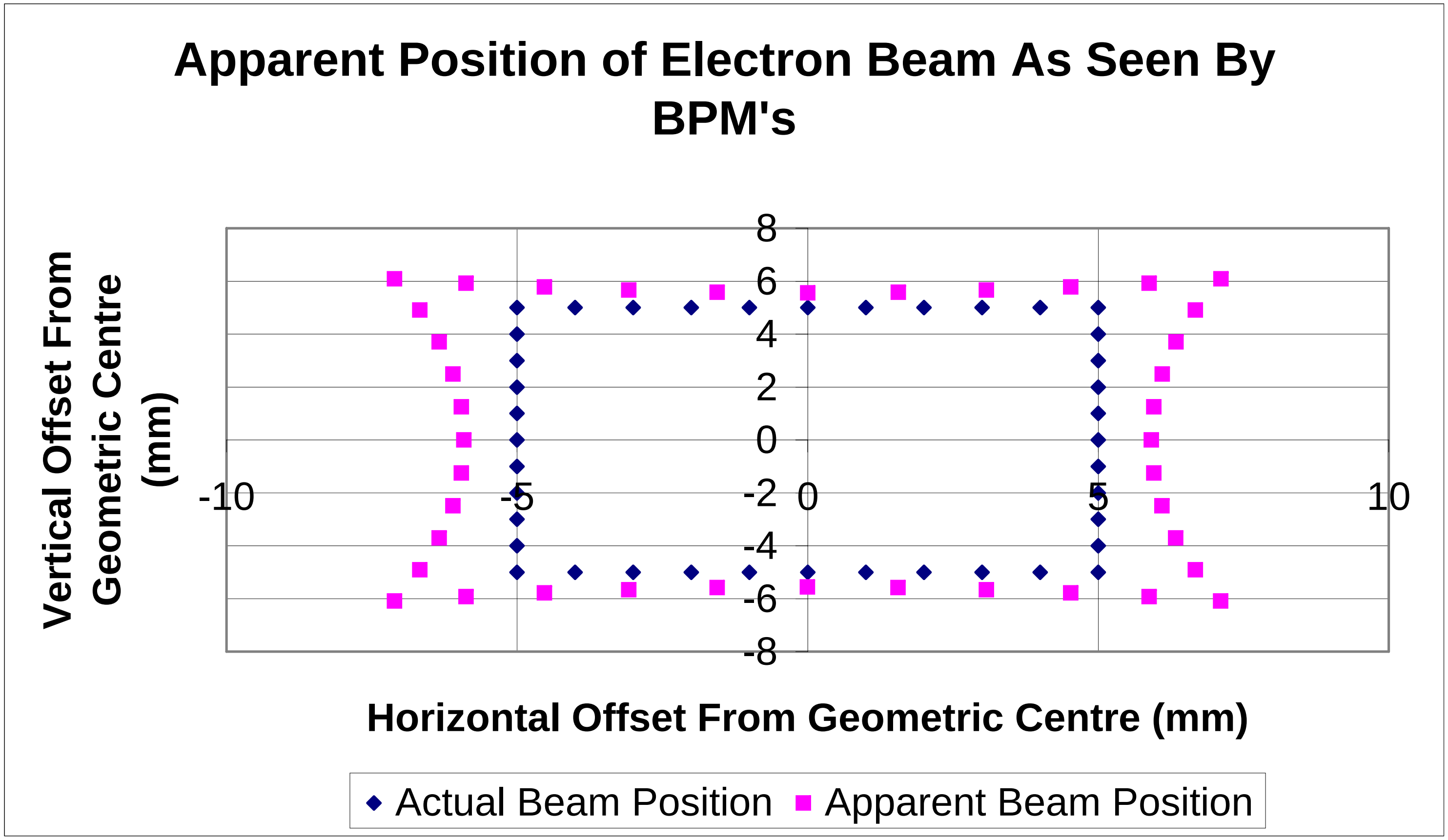

Figure 3: Beam Positions As Seen By BPM’s

Appendix

Theory

Given that the vacuum chamber is a perfect conductor and within the chamber exists a charge, then an equal and opposite charge will be produced on the surface of the conductor. Assuming that the button is flush with the surface of the cavity then a fraction of the charge will lie on the surface area of the button.

For a region in space surrounded by a closed Gaussian surface Gauss's Law states that the charge contained within that surface will be proportional to the electric flux through the Gaussian surface.

Equation 1. Gauss's Law

$$\oint \vec{E} \cdot d\vec{a} = \frac{Q_{net}}{\varepsilon_0}$$

Q_{net} - Net charge enclosed within the Gaussian surface

$\vec{E}$ - Electric field component normal to the infinitesimal piece of area

$d\vec{a}$ - Infinitesimal piece of area

ε_0 - Permitivity of free space

$\oint$ -Is understood to mean an integral over the entire closed Gaussian surface

The vector symbols shall be dropped in the following equations because the angle between the electric field vector and the area vector is zero, leaving just the magnitudes of the two vectors after their dot product is taken.

Imagine a short Gaussian cylinder (Fig. 1) that has an axis of symmetry perpendicular to the surface of the conductor and with a radius equal to that of a button radius. With one side terminating within the conductor (but not through) and the other side terminating just outside of the surface of the conductor.

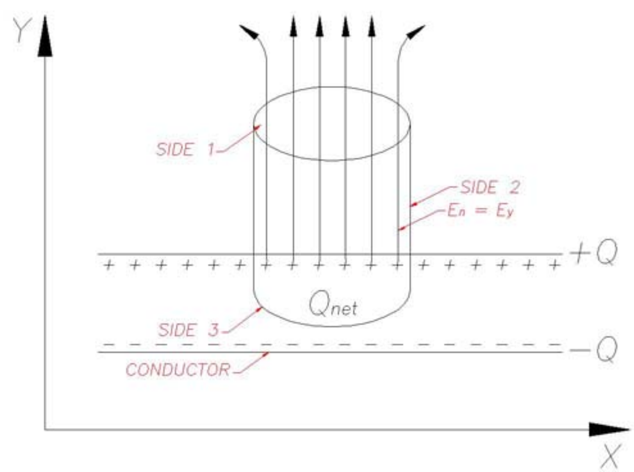

Figure 1. Electric Fields in The Region of a Thin Conductor

In this case the electric field near the surface of the conductor are normal to the surface. If the electric field lines were not normal to the surface of the conductor then this would imply that there is a surface current meaning that the cavity would not be in electrostatic equilibrium. The electric field lines do not penetrate the sides of the cylinder so they do not contribute to the integral of Eq. 1. The bottom of the cylinder does not contribute to the integral because no electric fields exist between the two surfaces of the thin conductor. The only contribution to the integral is the circular area at the top of the cylinder. This reduces the surface integral to the integral of the normal components of the field lines through the top surface of the cylinder.

Equation 2. Total Electric Flux Through the Gaussian Cylinder

$$\oint \vec{E} \cdot d\vec{a} = \int_{side1} \vec{E}_1 \cdot d\vec{a} + \int_{side2} \vec{E}_2 \cdot d\vec{a} + \int_{side3} \vec{E}_3 \cdot d\vec{a} = \frac{Q_{net}}{\varepsilon_0}$$

$$\int_{side1} \vec{E}_n \cdot d\vec{a} + 0 + 0 = \frac{Q_{net}}{\varepsilon_o}$$

$$\int_{side1} \vec{E}_n \cdot d\vec{a} = \frac{Q_{net}}{\varepsilon_o}$$

$\vec{E}_n$ - Component of the Electric field perpendicular to the surface of the button

Looking into the plane of the button (Fig. 2) electric field from a strip of infinitesimal area parallel to the z-axis is constant and normal to the surface area of the button. The total electric field from an infinitesimal strip is then twice the height, $h(x)$, multiplied by the normal electric field component, $\vec{E}_n(x)$, and the infinitesimal width of the strip, each function evaluated at the x-coordinate of where the strip intersects the x-axis (x-axis is collinear with the diameter of the button). The total electric flux then is the some of these strip areas evaluated along the diameter of the button from one side of the circle to the other side.

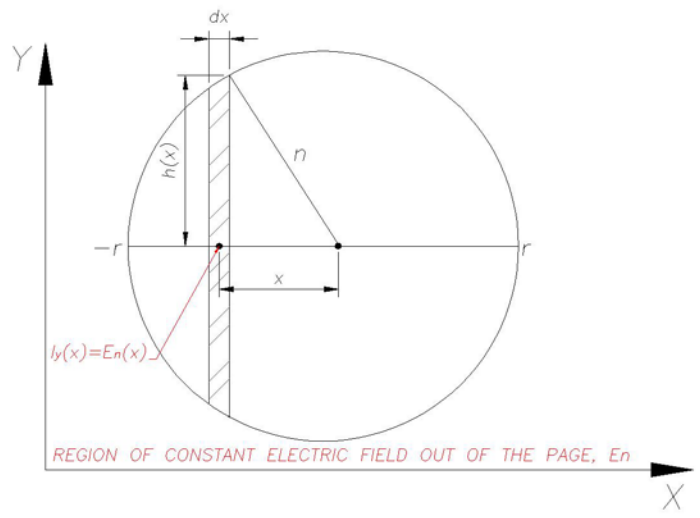

Figure 2. Surface of Button Position Monitor Flush With Cavity Wall

Equation 3. Electric Flux Near the Surface of the Button

$$2 \int_{side1} E_n(x) h(x) dx = \frac{Q_{net}}{\varepsilon_o}$$

$h(x)$ -height of the button evaluated at a point on the x-axis of the button

dx -infinitesimal width of a strip of area along the button

It is convenient to recast Eq. 3 by dividing the left and the right hand sides of the equation by the surface area of side 1.

The electric flux near the surface of the button is related to the voltage on the button by the following:

$$V_{Button} = \frac{Q_{net}}{C}$$

$$V_{Button} = \frac{2\varepsilon_o \int_{side1} E_n(x)h(x)dx}{C}$$

Equation 4. Average Electric Field

$$\frac{2\int_{-r}^{r} E_n(x)h(x)dx}{2\int_{-r}^{r} h(x)dx} = \frac{Q_{net}}{2\varepsilon_o \int_{-r}^{r} h(x)dx}$$

$$\frac{2\int_{-r}^{r} E_n(x)h(x)dx}{\pi r^2} = \frac{Q_{net}}{\varepsilon_o A}$$

r - Radius of side 1.

A - Surface area of side 1.

The left hand side of Eq. 4 is now the average normal electric field over the surface area of the button and the right hand side is essentially the surface charge density multiplied by a constant.

In cases where the geometry of the chamber is not simple then the electric field may not be constant in magnitude along the diameter of the button (an example of a constant electrostatic field is two parallel conducting sheets) and or the geometry may not give way to an analytic solution to the electric field. A numerical approximation may be used if the normal electric field components can be determined at equally spaced points along the diameter of the button. The integral in Eq. 4 may then be approximated using numerical integration such as the trapezoidal rule, this is done in Eq. 6, the geometric relations between the strips of an infinitesimal area and the circular button may be seen in Fig. 2.

Equation 5. Trapezoidal Rule

$$\int_a^b f(\xi)d\xi = \frac{b-a}{N}\left(\sum_{i=1}^{i=N-1} f(\xi_i) + \frac{1}{2}\left[f(\xi_0) + f(\xi_N)\right]\right)$$

ξ - Independent variable

b, a -Last and first points in the range of integration

Equation 6. Numerical Approximation of Eq. 5

$$\frac{2\int_{-r}^{r} E_n(x)h(x)dx}{\pi r^2} = \frac{2\frac{r-(-r)}{N}\left(\sum_{i=1}^{i=N-1} E_n(x_i)\cdot h(x_i) + \frac{1}{2}\left[h(x_0)\cdot E_n(x_0) + h(x_N)\cdot E\ \ (x_N)\right]\right)}{\pi r^2}$$

$$= \frac{4\left(\sum_{i=1}^{i=N-1} E_n(x_i)\cdot h(x_i) + \frac{1}{2}\left[h(x_0)\cdot E_n(x_0) + h(x_N)\cdot E_n(x_N)\right]\right)}{N\pi r}$$

$$h(x_i) = \sqrt{r^2 - x_i^2} = r\sqrt{1-\left(\frac{x_i}{r}\right)^2}$$

$$w(x_i) \equiv \sqrt{1-\left(\frac{x_i}{r}\right)^2} \Rightarrow h(x_i) = r\cdot w(x_i)$$

$$= \frac{4\left(\sum_{i=0}^{i=N} E_n(x_i)\cdot w(x_i)\right)}{N\pi}$$

$$\frac{4\left(\sum_{i=0}^{i=N} E_n(x_i)\cdot w(x_i)\right)}{N\pi} \approx \frac{Q_{net}}{\varepsilon_0 A}$$

$$W \equiv \varepsilon_0 A$$

$$\overline{E} = \frac{4\left(\sum_{i=0}^{i=N} E_n(x_i)\cdot w(x_i)\right)}{N\pi}$$

$$Q_{net} = W\cdot\overline{E}$$

W - Constant of proportionality

$\overline{E}$ - Average normal electric field component from the surface of the button

$w(x_i)$ - Defined as the weighting factor in the summation.

N -Number of points

The range of summation in Eq. 6 was changed to include the first and last values in the numerical integration because the height at the coordinate end points of the diameter of the circle are zero and do not contribute anything to the summation.

The voltage on a button is equal to the charge on the button divided by the capacitance of the button. Substituting the net charge of Eq. 6 into Eq. 7 and absorb the capacitance into the constant W yields the relationship between the voltage induced in the button and the electric field produced by the beam near the surface of the button.

Equation 7. Voltage on a button

$$V = \frac{Q}{C}$$

$$V = W \cdot \overline{E}$$

V - Voltage on the button induced by the charge on the surface of the button

In the case of the system being in electrostatic equilibrium, the button voltage induced by the separation of charge between the cavity and the button is related to the total charge on the button by the capacitance. In the case where the charge on the button is a function of time the voltage will also be a function of time.

By knowing the voltage induced on each button one may determine the horizontal and vertical offsets of the beam from the geometric centre of the cavity. The equations for determining the horizontal and vertical offsets are shown in Eq. 8a and 8b respectively. Refer to Fig. 4 In the appendix for the labelling of the buttons and their relative positions.

Equation 8a. Horizontal offset

$$X = K_x \frac{V_B + V_D - V_A - V_C}{V_A + V_B + V_C + V_D}$$

X - Horizontal offset from geometric centre

K_x - Horizontal gain

V_A, V_B, V_C, V_D -Voltage induced on buttons A, B,C, and D respectively

Equation 8b. Vertical offset

$$Y = K_Y \frac{V_A + V_B - V_C - V_D}{V_A + V_B + V_C + V_D}$$

Y - Vertical offset from geometric centre

K_Y - Vertical gain

The horizontal and vertical gains are wired into the hardware and may be predetermined by finite element modelling. The horizontal gain may be determined by modelling the system with the beam displaced horizontally from the centre of the cavity. Likewise the vertical gain may be determined in the same manner. The displacements one chooses are arbitrary but they will be the calibration points for the hardware.

Assuming that the capacitance for each button is the same then the voltages induced on the buttons may be replaced with the average electric field in the region above the button, the constant of proportionality cancelling between the numerator and the denominator as seen in Eq. 9 for the equations of offset.

Equation 9. Horizontal Offset Recast In Terms of Average Electric Fields

$$X = K_X \frac{V_B + V_D - V_A - V_C}{V_A + V_B + V_C + V_D}$$

$$X = K_X \frac{W_B \cdot \overline{E}_B + W_D \cdot \overline{E}_D - W_A \cdot \overline{E}_A - W_C \cdot \overline{E}_C}{W_A \cdot \overline{E}_A + W_B \cdot \overline{E}_B + W_C \cdot \overline{E}_C + W_D \cdot \overline{E}_D}$$

$$W_A = W_B = W_C = W_D$$

$$X = K_X \frac{\overline{E}_B + \overline{E}_D - \overline{E}_A - \overline{E}_C}{\overline{E}_A + \overline{E}_B + \overline{E}_C + \overline{E}_D}$$

The BPM's may be treated as an RC circuit with a current source (wall current from the beam), capacitor (the button), and a resistor (50Ω cable) in parallel. If the RC time constant is significantly greater then the temporal width of an electron bunch then the button will experience the full effect of the charge, and the charge distribution in a bunch may be approximated as a square (as opposed to a Gaussian). If this is not the case then the charge experienced by each button has time dependence, but in Eq. 9 this time dependence will cancel between the numerator and the denominator. Therefore Eq. 9 will hold true in the case where the RC time constant is less than the temporal width of a bunch. Summing the currents at a node in the circuit and applying a formal application of Fourier integrals will show this.

$$i_B(t) = \frac{1}{R} v(t) + C \frac{dv(t)}{dt}$$

$i_B(t)$ - Current input into the button circuit

$v(t)$ - Voltage as a function of time

R - 50Ω cable

C - Capacitance of the button

The current input into a particular button circuit from the wall current will be dependant upon the position of the beam, the properties of the beam, and the profile of an electron bunch. An electron bunch on average will have a Gaussian profile.

$$i_B(t) = i_{Button} \cdot i(t)$$

$$i(t) = e^{-\alpha t^2}$$

i_{Button} - A function representing the properties of the beam, button, and cavity.

$i(t)$ - The Gaussian profile of an electron bunch

α -A constant dependant on the properties of the beam

Applying a Fourier transform to the above differential equation will yield the following:

$$\Im[i_B(t)] = \frac{1}{R}\Im[v(t)] + C\Im[\frac{dv(t)}{dt}]$$

$$I_B(\omega) = \frac{1}{R}V(\omega) + Cj\omega V(\omega)$$

$$V(\omega) = [\frac{R}{1+RCj\omega}]\cdot I_B(\omega)$$

$$H(\omega) = \frac{R}{1+RCj\omega} \Leftrightarrow h(t) = \frac{1}{C}e^{\frac{-t}{RC}}$$

$$v(t) = \Im^{-1}[V(\omega)] = \Im^{-1}\left[[\frac{R}{1+RCj\omega}]\cdot I_B(\omega)\right] = h(t) * I_B(t)$$

The two transforms multiplied together are equivalent to the convolution of the respective inverse transforms.

$$v(t) = \frac{1}{C}\int_0^\infty e^{\frac{-t}{RC}} \cdot i_{Button} \cdot e^{-\alpha(t-\lambda)^2} d\lambda$$

$$v(t) = \frac{i_{Button}}{C} e^{\frac{-t}{RC}} \int_0^\infty e^{-\alpha(t-\lambda)^2} d\lambda$$

Completing the square of the exponent in the integral and recasting it in a more convenient form will yield the solution to the voltage.

$$v(t) = \frac{i_{Button}}{C} e^{\frac{-t}{RC}} \int_0^\infty e^{-\alpha(t^2-2t\lambda+\lambda^2)} d\lambda$$

$$v(t) = \frac{i_{Button}}{C} e^{\frac{-t}{RC}-\alpha t^2} \int_0^\infty e^{(\alpha 2t\lambda-\alpha\lambda^2)} d\lambda$$

$$-\alpha\lambda^2 + \alpha 2t\lambda$$

$$v(t) = \frac{i_{Button}}{C}\frac{1}{2}\sqrt{\frac{\pi}{\alpha}}\sigma e^{\frac{-t}{RC}}$$

$$Q(t) = i_{Button}\frac{1}{2}\sqrt{\frac{\pi}{\alpha}}\sigma e^{\frac{-t}{RC}}$$

$$\xi(t) \equiv \frac{1}{2}\sqrt{\frac{\pi}{\alpha}}\sigma e^{\frac{-t}{RC}}$$

$Q(t)$-Charge on the capacitor as a function of time

$\xi(t)$-Is defined as the time dependant portion of the charge function

Given that the resistance and the capacitance for each button are the same then the time dependant portion of Eq. 9 wil cancel between the numerator and the denominator. This leaves the portion of the charge function that is defined by the beam, button, and their relevant properties.

$$Q(t) = i_{Button}\xi(t)$$

$$X = K_X \frac{V_B(t) + V_D(t) - V_A(t) - V_C(t)}{V_A(t) + V_B(t) + V_C(t) + V_D(t)}$$

$$X = K_X \frac{Q_B(t) + Q_D(t) - Q_A(t) - Q_C(t)}{Q_A(t) + Q_B(t) + Q_C(t) + Q_D(t)}$$

$$X = K_X \frac{i_B\xi_B(t) + i_D\xi_D(t) - i_A\xi_A(t) - i_C\xi_C(t)}{i_A\xi_A(t) + i_B\xi_B(t) + i_C\xi_C(t) + i_D\xi_D(t)}$$

$$\xi_A(t) = \xi_B(t) = \xi_C(t) = \xi_D(t)$$

$$X = K_X \frac{i_B + i_D - i_A - i_C}{i_A + i_B + i_C + i_D}$$

Example of An Automesh Input File

Vacuum Chamber

```
&reg kprob=0,       ;Poisson problem
xjfact=0,  ;
dx=.3               ;mesh interval
mode=-1,            ;finite permitivity (default)
mat=1,              ;material (vacuum) relative permitivity unity
nbsup=0,            ! Dirichlet boundary condition at upper edge
nbslo=1,            ! Dirichlet boundary condition at lower edge
```

```
nbslf=1,            ! Dirichlet boundary condition at left edge
nbsrt=0             ! Dirichlet boundary condition at right edge
ibound=0,           ! Dirichlet boundary condition on internal bounds
conv=.10  ;units in mm (default = 1cm, Note: does not effect EM units)
icylin=0,   ;rectangular coordinates, abscissa is x-axis and ordinate is y-axis,
xmax=65.0,
ymax=35.0&
&po x=16.5, y=3.0&                                          ;Point1
&po x=51.5, y=3.0&                                          ;Point2
&po nt=2, x0=51.5, y0=8.0, r=5.0, theta=-41.0700&           ;Point3
&po x=63.6351, y=13.5669&                                   ;Point4
&po nt=2, x0=60.0, y0=17.0, r=5.0, theta=0&                 ;Point5
&po x=65.0, y=21.0&                                         ;Point6
&po nt=2, x0=60.0, y0=21.0, r=5.0, theta=43.3600&           ;Point7
&po x=55.1351, y=33.4331&                                   ;Point8
&po nt=2, x0=51.5, y0=30.0, r=5.0, theta=90.0&              ;Point9
&po x=16.5, y=35&                                           ;Point10
&po nt=2, x0=16.5, y0=30, r=5.0, theta=136.6400&            ;Point11
&po x=4.3649, y=24.4331&                                    ;Point12
&po nt=2, x0=8, y0=21.0, r=5.0, theta=180.0000&             ;Point13
&po x=3., y=17.&                                            ;Point14
&po nt=2, x0=8., y0=17., r=5.0, theta=223.3600&             ;Point15
&po x=12.8649, y=4.5669&                                    ;Point16
&po nt=2, x0=16.5, y0=8., r=5.0, theta=270.0000& ;Point17
&reg mat=1, cur=.000000001&
;&po x0=34.0, y0=19.0, r=1.0, theta=360&
&po x=34,y=29&
```

Geometry of The Cavity and Positions of The BPM's

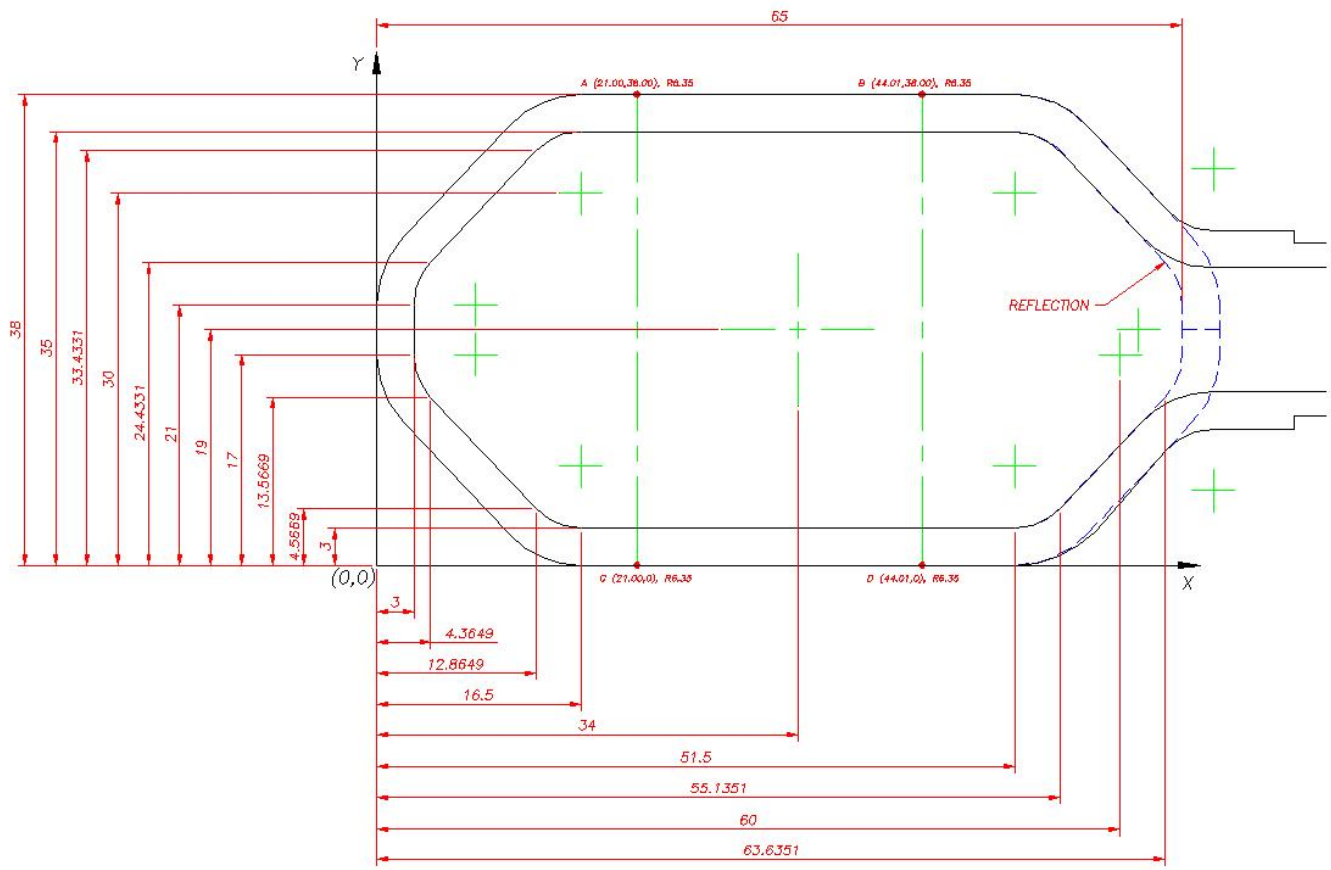

Figure 4a. Dimension of Vacuum Cavity and Positions of BPM's

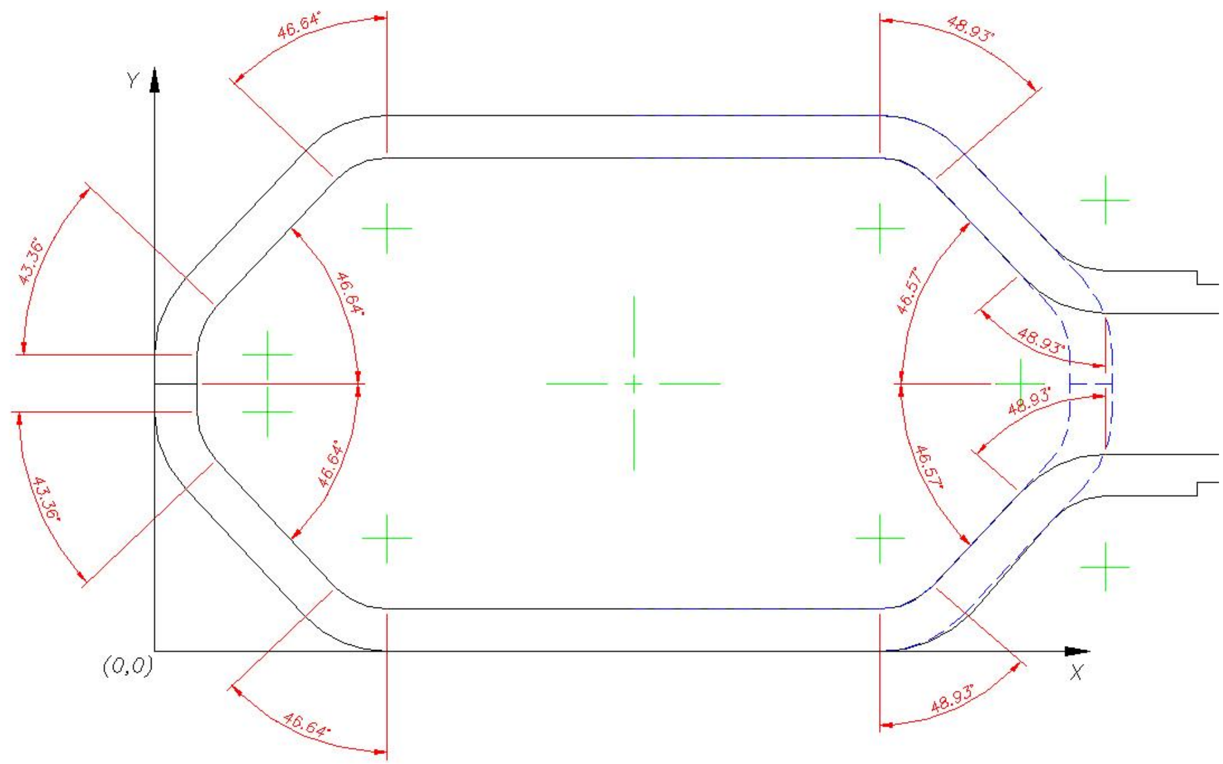

Figure 4b. Dimensions of Vacuum Cavity

Square Beam Position Data

Table 2a					
Position		Average Electric Field Across Button			
X-(mm)	Y- (mm)	A (V/cm)	B (V/cm)	C (V/cm)	D (V/cm)
29	24	2235.24813	864.30574	876.69221	531.14045
30	24	2094.18079	966.59145	853.39302	569.60428
31	24	1942.62876	1079.41443	825.80027	608.57774
32	24	1786.50773	1202.96037	794.61014	647.67035
33	24	1630.93086	1336.94453	760.51745	686.39062
34	24	1479.97323	1480.34698	724.24389	724.19836
35	24	1336.55507	1631.26977	686.42582	760.47017

Table 2b						
Position		Displacement From Centre			Apparent Offset of Beam	
X-(mm)	Y- (mm)	Horizontal (mm)	Vertical (mm)	Charge Density (nC/cm)	X-(mm)	Y- (mm)
29	24	-5	5	1	-7.109764459	6.085267707
30	24	-4	5	1	-5.876757548	5.92224863
31	24	-3	5	1	-4.526378305	5.776281973
32	24	-2	5	1	-3.077337672	5.660353579
33	24	-1	5	1	-1.556716845	5.585810176
34	24	0	5	1	0.001389908	5.56001205
35	24	1	5	1	1.559470378	5.585748135

Table 2c					
Position		Sensitivity		Gain	
X-(mm)	Y- (mm)	X (%)	Y (%)	X (V/%)	Y (V/%)
29	24	7.616361005	7.50643948	0.131296297	0.133218952
30	24	7.869372341	7.305348437	0.127074938	0.13688601
31	24	8.08149867	7.125292286	0.123739425	0.14034512
32	24	8.241522902	6.982289625	0.121336798	0.143219496
33	24	8.338192877	6.890337131	0.119930063	0.14513078
34	24	Undefined	6.858514033	0	0.145804178
35	24	8.352941538	6.890260601	0.119718305	0.145132392

Table 3a					
Position		Average Electric Field Across Button			
X-(mm)	Y- (mm)	A (V/cm)	B (V/cm)	C (V/cm)	D (V/cm)
36	24	1202.59686	1786.7779	647.70767	794.55755
37	24	1079.06697	1942.78256	608.61281	825.75681
38	24	966.2615	2094.16777	569.62164	853.36012
39	24	863.99455	2235.05822	531.12798	876.66407
39	23	854.15974	2048.39373	577.29981	975.71115
39	22	835.97526	1876.80981	622.28761	1080.3951
39	21	810.95124	1718.60497	665.65961	1191.47806

Table 3b						
Position		Displacement From Centre			Apparent Offset of Beam	
X-(mm)	Y- (mm)	Horizontal (mm)	Vertical (mm)	Charge Density (nC/cm)	X-(mm)	Y- (mm)
36	24	2	5	1	3.079703898	5.660206677
37	24	3	5	1	4.528354599	5.775869792
38	24	4	5	1	5.878337937	5.921538103
39	24	5	5	1	7.111056525	6.084342517
39	23	5	4	1	6.673505647	4.910882441
39	22	5	3	1	6.337906211	3.709064303
39	21	5	2	1	6.100839897	2.48529558

Table 3c					
Position		Sensitivity		Gain	
X-(mm)	Y- (mm)	X (%)	Y (%)	X (V/%)	Y (V/%)
36	24	8.247859972	6.982108416	0.121243571	0.143223213
37	24	8.085027192	7.124783843	0.123685422	0.140355135
38	24	7.871488586	7.30447197	0.127040774	0.136902435
39	24	7.617745135	7.505298219	0.131272441	0.133239209
39	23	7.149017167	7.572230922	0.139879368	0.132061477
39	22	6.789505052	7.625483945	0.147286141	0.131139218
39	21	6.535546903	7.664297514	0.153009383	0.130475102

Table 4a

Position		Average Electric Field Across Button			
X-(mm)	Y- (mm)	A (V/cm)	B (V/cm)	C (V/cm)	D (V/cm)
39	20	780.38949	1572.25804	706.91716	1309.81516
39	19	745.40926	1436.38891	745.45828	1436.3907
39	18	706.90041	1309.83853	780.48444	1572.23368
39	17	665.63248	1191.51916	811.09491	1718.55235
39	16	622.26252	1080.43132	836.16209	1876.74706
39	15	577.2871	975.74292	854.38729	2048.31961
39	14	531.10056	876.70864	864.28629	2234.85089

Table 4b

Position		Displacement From Centre			Apparent Offset of Beam	
X-(mm)	Y- (mm)	Horizontal (mm)	Vertical (mm)	Charge Density (nC/cm)	X-(mm)	Y- (mm)
39	20	5	1	1	5.959631539	1.246480716
39	19	5	0	1	5.912463495	-0.000188788
39	18	5	-1	1	5.959187869	-1.24669606
39	17	5	-2	1	6.100148834	-2.485520967
39	16	5	-3	1	6.336916109	-3.709365464
39	15	5	-4	1	6.672169666	-4.911181275
39	14	5	-5	1	7.109127134	-6.084447375

Table 4c

Position		Sensitivity		Gain	
X-(mm)	Y- (mm)	X (%)	Y (%)	X (V/%)	Y (V/%)
39	20	6.384276936	7.687937912	0.156634809	0.130073891
39	19	6.333747998	Undefined	0.1578844	0
39	18	6.383801652	7.689266089	0.156646471	0.130051423
39	17	6.534806599	7.664992576	0.153026717	0.130463271
39	16	6.788444402	7.626103104	0.147309154	0.131128571
39	15	7.147585993	7.572691702	0.139907376	0.132053441
39	14	7.615678268	7.505427566	0.131308068	0.133236913

Table 5a					
Position		Average Electric Field Across Button			
X-(mm)	Y- (mm)	A (V/cm)	B (V/cm)	C (V/cm)	D (V/cm)
38	14	569.58721	853.36852	966.55867	2094.10098
37	14	608.57773	825.76131	1079.38863	1942.72487
36	14	647.68532	794.5604	1202.943	1786.72928
35	14	686.42976	760.47503	1336.90794	1631.22881
34	14	724.25964	724.19515	1480.30641	1480.31023
33	14	760.5649	686.38828	1631.2291	1336.9154
32	14	794.68516	647.66521	1786.72978	1202.93536

Table 5b						
Position		Displacement From Centre			Apparent Offset of Beam	
X-(mm)	Y- (mm)	Horizontal (mm)	Vertical (mm)	Charge Density (nC/cm)	X-(mm)	Y- (mm)
38	14	4	-5	1	5.876732838	-5.922195435
37	14	3	-5	1	4.526694023	-5.776638934
36	14	2	-5	1	3.077953911	-5.661011372
35	14	1	-5	1	1.557695614	-5.586455502
34	14	0	-5	1	-0.0002569	-5.560666374
33	14	-1	-5	1	-1.558200916	-5.586235227
32	14	-2	-5	1	-3.078530742	-5.660477866

Table 5c					
Position		Sensitivity		Gain	
X-(mm)	Y- (mm)	X (%)	Y (%)	X (V/%)	Y (V/%)
38	14	7.869339252	7.305282818	0.127075472	0.13688724
37	14	8.08206236	7.125732612	0.123730795	0.140336447
36	14	8.243173272	6.983101041	0.121312505	0.143202854
35	14	8.343435428	6.891133169	0.119854706	0.145114015
34	14	Undefined	6.85932117	0	0.145787021
33	14	8.346141959	6.89086145	0.119815839	0.145119737
32	14	8.244718101	6.982442938	0.121289775	0.143216351

Table 6a					
Position		Average Electric Field Across Button			
X-(mm)	Y- (mm)	A (V/cm)	B (V/cm)	C (V/cm)	D (V/cm)
31	14	825.91681	608.5741	1942.72212	1079.3894
30	14	853.55772	569.59713	2094.0925	966.56654
29	14	876.90866	531.14767	2234.97487	864.26468
29	15	975.99053	577.32136	2048.3247	854.39531
29	16	1080.70346	622.30843	1876.73923	836.16506
29	17	1191.81826	665.69192	1718.53035	811.1011
29	18	1310.19781	706.95206	1572.16955	780.52391

Table 6b						
Position		Displacement From Centre			Apparent Offset of Beam	
X-(mm)	Y- (mm)	Horizontal (mm)	Vertical (mm)	Charge Density (nC/cm)	X-(mm)	Y- (mm)
31	14	-3	-5	1	-4.527193661	-5.775884928
30	14	-4	-5	1	-5.877151068	-5.921211021
29	14	-5	-5	1	-7.109812305	-6.083454857
29	15	-5	-4	1	-6.672609593	-4.90987827
29	16	-5	-3	1	-6.337377476	-3.70791679
29	17	-5	-2	1	-6.100572203	-2.483943318
29	18	-5	-1	1	-5.959532807	-1.244969686

Table 6c					
Position		Sensitivity		Gain	
X-(mm)	Y- (mm)	X (%)	Y (%)	X (V/%)	Y (V/%)
31	14	8.082954425	7.124802515	0.123717139	0.140354767
30	14	7.86989929	7.304068501	0.127066429	0.136909997
29	14	7.61641226	7.504203252	0.131295414	0.133258651
29	15	7.148057266	7.570682562	0.139898152	0.132088486
29	16	6.788938643	7.623124767	0.147298429	0.131179802
29	17	6.535260135	7.66012733	0.153016097	0.130546133
29	18	6.384171169	7.678618309	0.156637404	0.130231763

Table 7a					
Position		Average Electric Field Across			
X-(mm)	Y- (mm)	A	B	C	D
29	19	1436.77563	745.48437	1436.34193	745.4977
29	20	1572.61388	780.52422	1309.80659	706.94233
29	21	1718.95922	811.12405	1191.48006	665.67216
29	22	1877.1518	836.18919	1080.38565	622.28376
29	23	2048.64224	854.43891	975.70262	577.29541

Table 7b						
Position		Displacement From Centre			Apparent Offset of Beam	
X-(mm)	Y- (mm)	Horizontal (mm)	Vertical (mm)	Charge Density (nC/cm)	X-(mm)	Y- (mm)
29	19	-5	0	1	-5.912806273	0.001561754
29	20	-5	1	1	-5.959740374	1.248094606
29	21	-5	2	1	-6.100813956	2.486882798
29	22	-5	3	1	-6.337645165	3.710698451
29	23	-5	4	1	-6.672588988	4.912282165

Table 7c					
Position		Sensitivity		Gain	
X-(mm)	Y- (mm)	X (%)	Y (%)	X (V/%)	Y (V/%)
29	19	6.3341152	Undefined	0.157875247	Undefined
29	20	6.384393526	7.697891924	0.156631949	0.129905695
29	21	6.535519113	7.669192269	0.153010034	0.130391828
29	22	6.789225406	7.628843598	0.147292208	0.131081466
29	23	7.148035193	7.574389197	0.139898584	0.132023847

SF7 Input Files

ButtonA.txt

LINE

17.75 34.4 30.25 34.9

100

END

ButtonB.txt

LINE

37.75 34.9 50.25 34.9

100

END

ButtonC.txt

LINE

17.75 3.0 30.25 3.0

100

END

ButtonD.txt

LINE

37.75 3.0 50.25 3.0

100

END

C++ Poisson Automation Software

```
#include <stdlib.h>
#include <stdio.h>
#include <math.h>
#define NumElements 2048
#define PI 3.14159265

typedef struct
{
	double x[NumElements], y[NumElements];
} XYStruct;

void AutomeshFileOutput(double X, double Y);
XYStruct GenerateCoordinatesForSquare(double BeamCentre, double EdgeLength, double increment);
double ExtractFieldAndIntegrate(int value);
main()
{
//Declare Variables
FILE *ButtonFieldOutput;
XYStruct BeamPosition;
int i;
int v;
double IntegratedValue;
double button1;
double button2;
double button3;
double button4;

//Initialize variables
i = 0;
v = 0;
IntegratedValue = 0;
button1 = 0;
button2 = 0;
button3 = 0;
button4 = 0;
```

```
ButtonFieldOutput = fopen("H:\\LANL\\ButtonFieldOutput.txt", "wt");
BeamPosition.x[40];
BeamPosition.y[40];

printf("Generate Coordinates for Beam Position Iteration...");

BeamPosition = GenerateCoordinatesForSquare(34, 10, 1);

// Temporary Coordinates Fixes for first few points
BeamPosition.x[0]=34;
BeamPosition.y[0]=19;
BeamPosition.x[1]=35;
BeamPosition.y[1]=19;
BeamPosition.x[2]=34;
BeamPosition.y[2]=20;
BeamPosition.x[3]=44;
BeamPosition.y[3]=19;
BeamPosition.x[4]=34;
BeamPosition.y[4]=29;
BeamPosition.x[5]=44;
BeamPosition.y[5]=29;

printf("Completed\n");

        for(i = 0; i < 40; i++)
        {
                AutomeshFileOutput(BeamPosition.x[i], BeamPosition.y[i]);
printf("\n");
printf("Calculate Automesh for Beam Position x=%lf, y=%lf...", BeamPosition.x[i],
BeamPosition.y[i]);
        system("H:\\LANL\\automesh.exe BPM.txt");
printf("Completed\n");
system("H:\\LANL\\poisson.exe");
printf("\n");
```

```
printf("Calculate the Integrated Field over button1...");

button1 = ExtractFieldAndIntegrate(1);
printf("Completed\n");
printf("Calculate the Integrated Field over button2...");
button2 = ExtractFieldAndIntegrate(2);
printf("Completed\n");
printf("Calculate the Integrated Field over button3...");
button3 = ExtractFieldAndIntegrate(3);
printf("Completed\n");
printf("Calculate the Integrated Field over button4...");
button4 = ExtractFieldAndIntegrate(4);
printf("Completed\n");

        fprintf(ButtonFieldOutput, "%.3f  %.3f      %.5f      %.5f      %.5f      %.5f\n",
BeamPosition.x[i], BeamPosition.y[i], button1, button2, button3, button4);
        flushall();
        printf("%.3f %.3f %.5f %.5f %.5f %.5f\n", BeamPosition.x[i], BeamPosition.y[i], button1,
button2, button3, button4);
        }
}

double ExtractFieldAndIntegrate(int value)
{
// Declare Variables
FILE *SF7OUT;
char Buffer[256];
int i;
int v;
double gap;
double radius;
double Position;
double weight;
double IntegratedValue;
char *MagnitudeBuffer;
double Magnitude[101];
char *whitespace = "  ";
```

```
// Initialize Variables
SF7OUT = fopen("H:\\LANL\\OUTSF7.txt", "rt");
i = 0;
v = 0;
gap = 0;
radius = 6.25;
Position  = 6.25;
weight = 0;
IntegratedValue = 0;

if(value == 1)
{
system("H:\\LANL\\SF7.exe H:\\LANL\\button1.txt");
fgets(Buffer, 255, SF7OUT);
	while(!feof(SF7OUT) && !(strstr(Buffer, "Interpolated")))
	{
	fgets(Buffer, 255, SF7OUT);
		if(strstr(Buffer, "cm"))
		{
		for(i=0; i < 101; i++)
				{
				fgets(Buffer, 255, SF7OUT);
				MagnitudeBuffer = strtok(Buffer, whitespace);
				for(v=0; v < 3; v++)
					{
					MagnitudeBuffer = strtok(NULL, whitespace);
					}

					Magnitude[i] = atof(MagnitudeBuffer);
					Magnitude[i] = sqrt(pow(Magnitude[i], 2));
					}
		}
	}
```

```
for(i = 0; i < 101; i++)
{
weight = sqrt(1 - pow((Position/radius), 2));
IntegratedValue = (IntegratedValue + (4/(PI*100))*weight*Magnitude[i]);
gap = gap + radius/50;
Position = radius - gap;
}

}

if(value == 2)
{
system("H:\\LANL\\SF7.exe H:\\LANL\\button2.txt");
fgets(Buffer, 255, SF7OUT);
	while(!feof(SF7OUT) && !(strstr(Buffer, "Interpolated")))
	{
	fgets(Buffer, 255, SF7OUT);
	if(strstr(Buffer, "cm"))
		{
			for(i=0; i < 101; i++)
				{
				fgets(Buffer, 255, SF7OUT);
				MagnitudeBuffer = strtok(Buffer, whitespace);
					for(v=0; v < 3; v++)
					{
					MagnitudeBuffer = strtok(NULL, whitespace);
					}
				Magnitude[i] = atof(MagnitudeBuffer);
				Magnitude[i] = sqrt(pow(Magnitude[i], 2));
				}
		}




	}
```

```
for(i = 0; i < 101; i++)
{
weight = sqrt(1 - pow((Position/radius), 2));
IntegratedValue = (IntegratedValue + (4/(PI*100))*weight*Magnitude[i]);
gap = gap + radius/50;
Position = radius - gap;
}
}

if(value == 3)
{
system("H:\\LANL\\SF7.exe H:\\LANL\\button3.txt");

fgets(Buffer, 255, SF7OUT);

        while(!feof(SF7OUT) && !(strstr(Buffer, "Interpolated")))
        {
        fgets(Buffer, 255, SF7OUT);
                if(strstr(Buffer, "cm"))
                {
                        for(i=0; i < 101; i++)
                                {
                                fgets(Buffer, 255, SF7OUT);
                                MagnitudeBuffer = strtok(Buffer, whitespace);
                                        for(v=0; v < 3; v++)
                                        {
                                        MagnitudeBuffer = strtok(NULL, whitespace);
                                        }
                                Magnitude[i] = atof(MagnitudeBuffer);
                                Magnitude[i] = sqrt(pow(Magnitude[i], 2));
                                }
                }



        }
```

```
for(i = 0; i < 101; i++)
{
weight = sqrt(1 - pow((Position/radius), 2));
IntegratedValue = (IntegratedValue + (4/(PI*100))*weight*Magnitude[i]);
gap = gap + radius/50;
Position = radius - gap;
}
}

if(value == 4)
{
system("H:\\LANL\\SF7.exe H:\\LANL\\button4.txt");
fgets(Buffer, 255, SF7OUT);
        while(!feof(SF7OUT) && !(strstr(Buffer, "Interpolated")))
        {
        fgets(Buffer, 255, SF7OUT);
        if(strstr(Buffer, "cm"))
                {
                        for(i=0; i < 101; i++)
                                {
                                fgets(Buffer, 255, SF7OUT);
                                MagnitudeBuffer = strtok(Buffer, whitespace);
                                        for(v=0; v < 3; v++)
                                        {
                                        MagnitudeBuffer = strtok(NULL, whitespace);
                                        }
                                Magnitude[i] = atof(MagnitudeBuffer);
                                Magnitude[i] = sqrt(pow(Magnitude[i], 2));
                                }
                }




        }
```

```
for(i = 0; i < 101; i++)
{
weight = sqrt(1 - pow((Position/radius), 2));
IntegratedValue = (IntegratedValue + (4/(PI*100))*weight*Magnitude[i]);
gap = gap + radius/50;
Position = radius - gap;
}

}
return IntegratedValue;
}
XYStruct GenerateCoordinatesForSquare(double BeamCentre, double EdgeLength, double increment)
{
XYStruct BeamPosition;

int i = 0;
BeamPosition.x[40];
BeamPosition.y[40];

        for(i = 0; i < 10; i++)
        {
        //Top Edge
        BeamPosition.x[i] = i + 29;
        BeamPosition.y[i] = 24;

        //Right Edge
        BeamPosition.x[10 + i] = 39;
        BeamPosition.y[10 + i] = 24-i;

        //Bottom Edge
        BeamPosition.x[20 + i] = 39-i;
        BeamPosition.y[20 + i] = 14;
```

```
        //Left Edge
        BeamPosition.x[30 + i] = 29;
        BeamPosition.y[30 + i] = 14+i;
        }

return BeamPosition;

}



void AutomeshFileOutput(double X, double Y)
{
FILE *BPM;
BPM = fopen("H:\\LANL\\BPM.txt", "wt");
fprintf(BPM, "Vacuum Chamber");
fprintf(BPM, "\n");
fprintf(BPM, "&reg kprob=0,     ;Poisson problem\n");
fprintf(BPM, "xjfact=0,   ;\n");
fprintf(BPM, "dx=.3             ;mesh interval");
//fprintf(BPM, "IRTR=2,  ;Right Triangle selected");
fprintf(BPM, "mode=-1,  ;finite permitivity (default)\n");
fprintf(BPM, "mat=1,              ;material (vacuum) relative permitivity unity\n");
fprintf(BPM, "nbsup=0,      ! Dirichlet boundary condition at upper edge\n");
fprintf(BPM, "nbslo=0,      ! Dirichlet boundary condition at lower edge\n");
fprintf(BPM, "nbslf=0,      ! Dirichlet boundary condition at left edge\n");
fprintf(BPM, "nbsrt=0       ! Dirichlet boundary condition at right edge\n");
fprintf(BPM, "ibound=0,   ! Dirichlet boundary condition on internal bounds\n");
fprintf(BPM, "conv=.10           ;units in mm (default = 1cm, Note: does not effect EM units)\n");
fprintf(BPM, "icylin=0,          ;rectangular coordinates, abscissa is x-axis and ordinate is y-
axis,\n");
fprintf(BPM, "xmax=65.0,\n");
fprintf(BPM, "ymax=35.0&\n");
fprintf(BPM, "\n");
fprintf(BPM, "&po x=16.5, y=3.0&                                   ;Point1\n");
fprintf(BPM, "&po x=51.5, y=3.0&                                   ;Point2\n");
fprintf(BPM, "&po nt=2, x0=51.5, y0=8.0, r=5.0, theta=-41.0700& ;Point3\n");
fprintf(BPM, "&po x=63.6351, y=13.5669&                            ;Point4\n");
```

```
fprintf(BPM, "&po nt=2, x0=60.0, y0=17.0, r=5.0, theta=0&                    ;Point5\n");
fprintf(BPM, "&po x=65.0, y=21.0&                                              ;Point6\n");
fprintf(BPM, "&po nt=2, x0=60.0, y0=21.0, r=5.0, theta=43.3600&;Point7\n");
fprintf(BPM, "&po x=55.1351, y=33.4331&                                        ;Point8\n");
fprintf(BPM, "&po nt=2, x0=51.5, y0=30.0, r=5.0, theta=90.0&                   ;Point9\n");
fprintf(BPM, "&po x=16.5, y=35&                                                ;Point10\n");
fprintf(BPM, "&po nt=2, x0=16.5, y0=30, r=5.0, theta=136.6400& ;Point11\n");
fprintf(BPM, "&po x=4.3649, y=24.4331&                                         ;Point12\n");
fprintf(BPM, "&po nt=2, x0=8, y0=21.0, r=5.0, theta=180.0000&                  ;Point13\n");
fprintf(BPM, "&po x=3., y=17.&                                         ;Point14\n");
fprintf(BPM, "&po nt=2, x0=8., y0=17., r=5.0, theta=223.3600&                  ;Point15\n");
fprintf(BPM, "&po x=12.8649, y=4.5669&                                         ;Point16\n");
fprintf(BPM, "&po nt=2, x0=16.5, y0=8., r=5.0, theta=270.0000&  ;Point17\n");
fprintf(BPM, "\n");
fprintf(BPM,"&reg mat=1&\n");
fprintf(BPM,"&po x=29,y=24&\n");
fprintf(BPM,"&po x=30,y=24&\n");
fprintf(BPM,"&po x=31,y=24&\n");
fprintf(BPM,"&po x=32,y=24&\n");
fprintf(BPM,"&po x=33,y=24&\n");
fprintf(BPM,"&po x=34,y=24&\n");
fprintf(BPM,"&po x=35,y=24&\n");
fprintf(BPM,"&po x=36,y=24&\n");
fprintf(BPM,"&po x=37,y=24&\n");
fprintf(BPM,"&po x=38,y=24&\n");
fprintf(BPM,"&po x=39,y=24&\n");
fprintf(BPM,"&po x=39,y=23&\n");
fprintf(BPM,"&po x=39,y=22&\n");
fprintf(BPM,"&po x=39,y=21&\n");
fprintf(BPM,"&po x=39,y=20&\n");
fprintf(BPM,"&po x=39,y=19&\n");
fprintf(BPM,"&po x=39,y=18&\n");
fprintf(BPM,"&po x=39,y=17&\n");
fprintf(BPM,"&po x=39,y=16&\n");
fprintf(BPM,"&po x=39,y=15&\n");
fprintf(BPM,"&po x=39,y=14&\n");
fprintf(BPM,"&po x=38,y=14&\n");
```

```
fprintf(BPM,"&po x=37,y=14&\n");
fprintf(BPM,"&po x=36,y=14&\n");
fprintf(BPM,"&po x=35,y=14&\n");
fprintf(BPM,"&po x=34,y=14&\n");
fprintf(BPM,"&po x=33,y=14&\n");
fprintf(BPM,"&po x=32,y=14&\n");
fprintf(BPM,"&po x=31,y=14&\n");
fprintf(BPM,"&po x=30,y=14&\n");
fprintf(BPM,"&po x=29,y=14&\n");
fprintf(BPM,"&po x=29,y=15&\n");
fprintf(BPM,"&po x=29,y=16&\n");
fprintf(BPM,"&po x=29,y=17&\n");
fprintf(BPM,"&po x=29,y=18&\n");
fprintf(BPM,"&po x=29,y=19&\n");
fprintf(BPM,"&po x=29,y=20&\n");
fprintf(BPM,"&po x=29,y=21&\n");
fprintf(BPM,"&po x=29,y=22&\n");
fprintf(BPM,"&po x=29,y=23&\n");
fprintf(BPM, "\n");
fprintf(BPM,"&reg mat=1&\n");
fprintf(BPM, "&po, x=44, y=19&\n");
fprintf(BPM, "\n");
fprintf(BPM,"&reg mat=1&\n");
fprintf(BPM, "&po, x=34, y=29&\n");
fprintf(BPM, "\n");
fprintf(BPM, "&reg mat=1, cur=.000000001&\n");
fprintf(BPM, ";&po x0=34.0, y0=19.0, r=1.0, theta=360&\n");
fprintf(BPM, "&po x=%lf,y=%lf &\n", X, Y);

fclose(BPM);
}
```

SF7 Interpolation Output Files For Horizontal & Vertical Gain Settings

Button A, Horizontal Offset = 10mm

Los Alamos National Laboratory Poisson Superfish
Program SF7 written by James H. Billen and Lloyd M. Young

The original Poisson Superfish codes were developed by
Ron F. Holsinger in collaboration with Klaus Halbach.
These programs are provided as a service to the accelerator
community by the Los Alamos Accelerator Code Group (LAACG).

Program SF7 6.10 released 7-18-2001

SF.INI file: H:\LANL\SF.INI 8-03-2001 14:32:36
Starting from file BPM.T35 dump 1.
Memory used for BPM.T35 arrays: 1.579 M
Reading keyword commands and data from file:
BUTTON1.TXT.

Electric fields along a straight line with end points at:
(X1, Y1) = (17.75000, 34.40000)
(X2, Y2) = (30.25000, 34.90000)
Number of increments: 100

X (mm)	Y (mm)	Ex (V/cm)	Ey (V/cm)	|E| (V/cm)	V (V)
17.75000	34.40000	-2.063123E+01	2.129947E+02	2.139916E+02	1.277968E+01
17.87500	34.40500	-2.041279E+01	2.171998E+02	2.181569E+02	1.292339E+01
18.00000	34.41000	-2.011850E+01	2.214752E+02	2.223871E+02	1.306704E+01
18.12500	34.41500	-1.982629E+01	2.257246E+02	2.265937E+02	1.320489E+01
18.25000	34.42000	-1.968325E+01	2.299145E+02	2.307556E+02	1.333504E+01
18.37500	34.42500	-1.947542E+01	2.341525E+02	2.349610E+02	1.346377E+01
18.50000	34.43000	-1.931218E+01	2.383447E+02	2.391258E+02	1.358565E+01
18.62500	34.43500	-1.916455E+01	2.425823E+02	2.433381E+02	1.370590E+01
18.75000	34.44000	-1.899283E+01	2.467924E+02	2.475222E+02	1.382038E+01
18.87500	34.44500	-1.888976E+01	2.510394E+02	2.517491E+02	1.393269E+01
19.00000	34.45000	-1.878549E+01	2.553013E+02	2.559915E+02	1.404157E+01
19.12500	34.45500	-1.864568E+01	2.595451E+02	2.602139E+02	1.414521E+01
19.25000	34.46000	-1.857468E+01	2.638332E+02	2.644862E+02	1.424699E+01
19.37500	34.46500	-1.842707E+01	2.681173E+02	2.687497E+02	1.434427E+01
19.50000	34.47000	-1.838188E+01	2.724376E+02	2.730571E+02	1.443919E+01
19.62500	34.47500	-1.833430E+01	2.767880E+02	2.773945E+02	1.453137E+01
19.75000	34.48000	-1.820436E+01	2.811298E+02	2.817186E+02	1.461875E+01
19.87500	34.48500	-1.817661E+01	2.855237E+02	2.861017E+02	1.470447E+01
20.00000	34.49000	-1.803940E+01	2.899229E+02	2.904836E+02	1.478607E+01

20.12500	34.49500	-1.802736E+01	2.943648E+02	2.949163E+02	1.486542E+01
20.25000	34.50000	-1.788447E+01	2.988288E+02	2.993635E+02	1.494144E+01
20.37500	34.50500	-1.788490E+01	3.033226E+02	3.038494E+02	1.501447E+01
20.50000	34.51000	-1.788171E+01	3.078616E+02	3.083805E+02	1.508522E+01
20.62500	34.51500	-1.774759E+01	3.124076E+02	3.129113E+02	1.515177E+01
20.75000	34.52000	-1.775396E+01	3.170064E+02	3.175031E+02	1.521631E+01
20.87500	34.52500	-1.761385E+01	3.216294E+02	3.221114E+02	1.527740E+01
21.00000	34.53000	-1.762768E+01	3.262911E+02	3.267670E+02	1.533568E+01
21.12500	34.53500	-1.763726E+01	3.310058E+02	3.314754E+02	1.539177E+01
21.25000	34.54000	-1.750174E+01	3.357246E+02	3.361805E+02	1.544333E+01
21.37500	34.54500	-1.751676E+01	3.405087E+02	3.409589E+02	1.549314E+01
21.50000	34.55000	-1.737503E+01	3.453148E+02	3.457516E+02	1.553917E+01
21.62500	34.55500	-1.739401E+01	3.501710E+02	3.506027E+02	1.558261E+01
21.75000	34.56000	-1.724652E+01	3.550694E+02	3.554880E+02	1.562305E+01
21.87500	34.56500	-1.726817E+01	3.600003E+02	3.604142E+02	1.566001E+01
22.00000	34.57000	-1.728482E+01	3.649936E+02	3.654027E+02	1.569473E+01
22.12500	34.57500	-1.713839E+01	3.700037E+02	3.704004E+02	1.572516E+01
22.25000	34.58000	-1.715635E+01	3.750771E+02	3.754692E+02	1.575324E+01
22.37500	34.58500	-1.700385E+01	3.801881E+02	3.805682E+02	1.577781E+01
22.50000	34.59000	-1.702212E+01	3.853438E+02	3.857195E+02	1.579909E+01
22.62500	34.59500	-1.699865E+01	3.905812E+02	3.909510E+02	1.581854E+01
22.75000	34.60000	-1.688142E+01	3.958001E+02	3.961599E+02	1.583200E+01
22.87500	34.60500	-1.685331E+01	4.011303E+02	4.014841E+02	1.584465E+01
23.00000	34.61000	-1.678103E+01	4.064833E+02	4.068295E+02	1.585285E+01
23.12500	34.61500	-1.674396E+01	4.118521E+02	4.121923E+02	1.585631E+01
23.25000	34.62000	-1.662521E+01	4.173318E+02	4.176628E+02	1.585861E+01
23.37500	34.62500	-1.658590E+01	4.227971E+02	4.231223E+02	1.585489E+01
23.50000	34.63000	-1.654870E+01	4.283819E+02	4.287015E+02	1.585013E+01
23.62500	34.63500	-1.642737E+01	4.340399E+02	4.343506E+02	1.584246E+01
23.75000	34.64000	-1.641572E+01	4.397015E+02	4.400078E+02	1.582925E+01
23.87500	34.64500	-1.628815E+01	4.453510E+02	4.456488E+02	1.580996E+01
24.00000	34.65000	-1.623763E+01	4.511704E+02	4.514625E+02	1.579096E+01
24.12500	34.65500	-1.609999E+01	4.569345E+02	4.572181E+02	1.576424E+01
24.25000	34.66000	-1.604999E+01	4.628617E+02	4.631399E+02	1.573730E+01
24.37500	34.66500	-1.602350E+01	4.688003E+02	4.690741E+02	1.570481E+01
24.50000	34.67000	-1.584985E+01	4.747781E+02	4.750426E+02	1.566768E+01
24.62500	34.67500	-1.581740E+01	4.808208E+02	4.810809E+02	1.562668E+01
24.75000	34.68000	-1.566923E+01	4.868588E+02	4.871109E+02	1.557948E+01
24.87500	34.68500	-1.559864E+01	4.930741E+02	4.933207E+02	1.553183E+01
25.00000	34.69000	-1.552322E+01	4.992303E+02	4.994716E+02	1.547614E+01
25.12500	34.69500	-1.536816E+01	5.055653E+02	5.057988E+02	1.541974E+01
25.25000	34.70000	-1.531643E+01	5.119044E+02	5.121335E+02	1.535713E+01
25.37500	34.70500	-1.512283E+01	5.182970E+02	5.185176E+02	1.528976E+01
25.50000	34.71000	-1.506339E+01	5.247467E+02	5.249629E+02	1.521765E+01
25.62500	34.71500	-1.489153E+01	5.312004E+02	5.314091E+02	1.513921E+01
25.75000	34.72000	-1.479684E+01	5.378366E+02	5.380401E+02	1.505943E+01
25.87500	34.72500	-1.472295E+01	5.444847E+02	5.446837E+02	1.497333E+01
26.00000	34.73000	-1.451413E+01	5.511763E+02	5.513674E+02	1.488176E+01
26.12500	34.73500	-1.443138E+01	5.579390E+02	5.581256E+02	1.478538E+01
26.25000	34.74000	-1.421575E+01	5.647701E+02	5.649490E+02	1.468402E+01
26.37500	34.74500	-1.412254E+01	5.717861E+02	5.719605E+02	1.458055E+01
26.50000	34.75000	-1.402597E+01	5.786169E+02	5.787869E+02	1.446542E+01
26.62500	34.75500	-1.381063E+01	5.857550E+02	5.859178E+02	1.435100E+01
26.75000	34.76000	-1.369196E+01	5.927028E+02	5.928609E+02	1.422487E+01
26.87500	34.76500	-1.345954E+01	5.998462E+02	5.999972E+02	1.409639E+01
27.00000	34.77000	-1.333310E+01	6.071909E+02	6.073372E+02	1.396539E+01

27.12500	34.77500	-1.314031E+01	6.144829E+02	6.146234E+02	1.382587E+01
27.25000	34.78000	-1.297541E+01	6.218050E+02	6.219403E+02	1.367971E+01
27.37500	34.78500	-1.283543E+01	6.290797E+02	6.292106E+02	1.352521E+01
27.50000	34.79000	-1.259877E+01	6.366828E+02	6.368074E+02	1.337034E+01
27.62500	34.79500	-1.242442E+01	6.442204E+02	6.443402E+02	1.320652E+01
27.75000	34.80000	-1.220744E+01	6.518385E+02	6.519528E+02	1.303677E+01
27.87500	34.80500	-1.201772E+01	6.594911E+02	6.596006E+02	1.286008E+01
28.00000	34.81000	-1.182145E+01	6.672445E+02	6.673492E+02	1.267765E+01
28.12500	34.81500	-1.159099E+01	6.750285E+02	6.751281E+02	1.248803E+01
28.25000	34.82000	-1.138871E+01	6.828988E+02	6.829938E+02	1.229218E+01
28.37500	34.82500	-1.114395E+01	6.908333E+02	6.909231E+02	1.208958E+01
28.50000	34.83000	-1.093032E+01	6.988317E+02	6.989172E+02	1.188014E+01
28.62500	34.83500	-1.068062E+01	7.069162E+02	7.069969E+02	1.166412E+01
28.75000	34.84000	-1.045111E+01	7.150318E+02	7.151081E+02	1.144051E+01
28.87500	34.84500	-1.021973E+01	7.232351E+02	7.233073E+02	1.121014E+01
29.00000	34.85000	-9.950917E+00	7.314983E+02	7.315659E+02	1.097247E+01
29.12500	34.85500	-9.707748E+00	7.398288E+02	7.398925E+02	1.072752E+01
29.25000	34.86000	-9.429622E+00	7.482299E+02	7.482893E+02	1.047522E+01
29.37500	34.86500	-9.174505E+00	7.566870E+02	7.567426E+02	1.021527E+01
29.50000	34.87000	-8.909055E+00	7.652326E+02	7.652844E+02	9.948024E+00
29.62500	34.87500	-8.619979E+00	7.738075E+02	7.738555E+02	9.672594E+00
29.75000	34.88000	-8.346828E+00	7.824648E+02	7.825093E+02	9.389578E+00
29.87500	34.88500	-8.044220E+00	7.911876E+02	7.912285E+02	9.098657E+00
30.00000	34.89000	-7.759047E+00	7.999680E+02	8.000056E+02	8.799648E+00
30.12500	34.89500	-7.449111E+00	8.088317E+02	8.088660E+02	8.492733E+00
30.25000	34.90000	-7.150171E+00	8.177255E+02	8.177567E+02	8.177255E+00

Button B, Horizontal Offset = 10mm

Los Alamos National Laboratory Poisson Superfish
Program SF7 written by James H. Billen and Lloyd M. Young

The original Poisson Superfish codes were developed by
Ron F. Holsinger in collaboration with Klaus Halbach.
These programs are provided as a service to the accelerator
community by the Los Alamos Accelerator Code Group (LAACG).

Program SF7 6.10 released 7-18-2001

SF.INI file: H:\LANL\SF.INI 8-03-2001 14:32:36
Starting from file BPM.T35 dump 1.
Memory used for BPM.T35 arrays: 1.579 M
Reading keyword commands and data from file:
   BUTTON2.TXT.

Electric fields along a straight line with end points at:

(X1, Y1) = (37.75000, 34.90000)
(X2, Y2) = (50.25000, 34.90000)
Number of increments: 100

X (mm)	Y (mm)	Ex (V/cm)	Ey (V/cm)	|E| (V/cm)	V (V)
37.75000	34.90000	-7.309174E+00	1.409472E+03	1.409491E+03	1.409472E+01
37.87500	34.90000	-7.219364E+00	1.418547E+03	1.418566E+03	1.418547E+01
38.00000	34.90000	-7.143896E+00	1.427590E+03	1.427608E+03	1.427590E+01
38.12500	34.90000	-7.038112E+00	1.436454E+03	1.436471E+03	1.436454E+01
38.25000	34.90000	-6.964282E+00	1.445258E+03	1.445274E+03	1.445258E+01
38.37500	34.90000	-6.847084E+00	1.453890E+03	1.453906E+03	1.453890E+01
38.50000	34.90000	-6.757206E+00	1.462382E+03	1.462398E+03	1.462382E+01
38.62500	34.90000	-6.641408E+00	1.470814E+03	1.470829E+03	1.470814E+01
38.75000	34.90000	-6.512658E+00	1.479035E+03	1.479049E+03	1.479035E+01
38.87500	34.90000	-6.420989E+00	1.487183E+03	1.487197E+03	1.487183E+01
39.00000	34.90000	-6.280613E+00	1.495122E+03	1.495135E+03	1.495122E+01
39.12500	34.90000	-6.185769E+00	1.502955E+03	1.502968E+03	1.502955E+01
39.25000	34.90000	-6.033759E+00	1.510592E+03	1.510604E+03	1.510592E+01
39.37500	34.90000	-5.881126E+00	1.518035E+03	1.518047E+03	1.518035E+01
39.50000	34.90000	-5.772138E+00	1.525403E+03	1.525414E+03	1.525403E+01
39.62500	34.90000	-5.608557E+00	1.532516E+03	1.532526E+03	1.532516E+01
39.75000	34.90000	-5.495830E+00	1.539511E+03	1.539521E+03	1.539511E+01
39.87500	34.90000	-5.320815E+00	1.546271E+03	1.546280E+03	1.546271E+01
40.00000	34.90000	-5.161677E+00	1.552813E+03	1.552822E+03	1.552813E+01
40.12500	34.90000	-5.018715E+00	1.559263E+03	1.559271E+03	1.559263E+01
40.25000	34.90000	-4.853653E+00	1.565394E+03	1.565402E+03	1.565394E+01
40.37500	34.90000	-4.702487E+00	1.571449E+03	1.571456E+03	1.571449E+01
40.50000	34.90000	-4.505327E+00	1.577203E+03	1.577210E+03	1.577203E+01
40.62500	34.90000	-4.372400E+00	1.582788E+03	1.582794E+03	1.582788E+01
40.75000	34.90000	-4.164683E+00	1.588123E+03	1.588129E+03	1.588123E+01
40.87500	34.90000	-3.960024E+00	1.593182E+03	1.593187E+03	1.593182E+01
41.00000	34.90000	-3.810935E+00	1.598140E+03	1.598145E+03	1.598140E+01
41.12500	34.90000	-3.593111E+00	1.602768E+03	1.602772E+03	1.602768E+01
41.25000	34.90000	-3.444503E+00	1.607217E+03	1.607220E+03	1.607217E+01
41.37500	34.90000	-3.217093E+00	1.611380E+03	1.611383E+03	1.611380E+01
41.50000	34.90000	-3.016555E+00	1.615247E+03	1.615250E+03	1.615247E+01
41.62500	34.90000	-2.829444E+00	1.619000E+03	1.619003E+03	1.619000E+01
41.75000	34.90000	-2.625089E+00	1.622349E+03	1.622351E+03	1.622349E+01
41.87500	34.90000	-2.430725E+00	1.625595E+03	1.625597E+03	1.625595E+01
42.00000	34.90000	-2.185992E+00	1.628481E+03	1.628482E+03	1.628481E+01
42.12500	34.90000	-2.021528E+00	1.631134E+03	1.631135E+03	1.631134E+01
42.25000	34.90000	-1.769182E+00	1.633503E+03	1.633504E+03	1.633503E+01
42.37500	34.90000	-1.584914E+00	1.635526E+03	1.635527E+03	1.635526E+01
42.50000	34.90000	-1.343288E+00	1.637428E+03	1.637428E+03	1.637428E+01
42.62500	34.90000	-1.084101E+00	1.638945E+03	1.638945E+03	1.638945E+01
42.75000	34.90000	-9.090055E-01	1.640229E+03	1.640230E+03	1.640229E+01
42.87500	34.90000	-6.437879E-01	1.641200E+03	1.641200E+03	1.641200E+01
43.00000	34.90000	-4.159929E-01	1.641813E+03	1.641813E+03	1.641813E+01
43.12500	34.90000	-1.966468E-01	1.642300E+03	1.642300E+03	1.642300E+01
43.25000	34.90000	3.211014E-02	1.642323E+03	1.642323E+03	1.642323E+01
43.37500	34.90000	2.565678E-01	1.642226E+03	1.642226E+03	1.642226E+01
43.50000	34.90000	5.312976E-01	1.641733E+03	1.641733E+03	1.641733E+01
43.62500	34.90000	7.150931E-01	1.640961E+03	1.640961E+03	1.640961E+01
43.75000	34.90000	9.932802E-01	1.639893E+03	1.639894E+03	1.639893E+01
43.87500	34.90000	1.193308E+00	1.638437E+03	1.638437E+03	1.638437E+01

44.00000	34.90000	1.458944E+00	1.636845E+03	1.636845E+03	1.636845E+01
44.12500	34.90000	1.739727E+00	1.634845E+03	1.634846E+03	1.634845E+01
44.25000	34.90000	1.927543E+00	1.632577E+03	1.632579E+03	1.632577E+01
44.37500	34.90000	2.210087E+00	1.629991E+03	1.629993E+03	1.629991E+01
44.50000	34.90000	2.447377E+00	1.627016E+03	1.627018E+03	1.627016E+01
44.62500	34.90000	2.681847E+00	1.623910E+03	1.623912E+03	1.623910E+01
44.75000	34.90000	2.917414E+00	1.620319E+03	1.620321E+03	1.620319E+01
44.87500	34.90000	3.154343E+00	1.616598E+03	1.616601E+03	1.616598E+01
45.00000	34.90000	3.438079E+00	1.612478E+03	1.612482E+03	1.612478E+01
45.12500	34.90000	3.626940E+00	1.608055E+03	1.608059E+03	1.608055E+01
45.25000	34.90000	3.910240E+00	1.603344E+03	1.603349E+03	1.603344E+01
45.37500	34.90000	4.111354E+00	1.598233E+03	1.598238E+03	1.598233E+01
45.50000	34.90000	4.381336E+00	1.592982E+03	1.592988E+03	1.592982E+01
45.62500	34.90000	4.663634E+00	1.587329E+03	1.587336E+03	1.587329E+01
45.75000	34.90000	4.850920E+00	1.581395E+03	1.581403E+03	1.581395E+01
45.87500	34.90000	5.131768E+00	1.575156E+03	1.575165E+03	1.575156E+01
46.00000	34.90000	5.318604E+00	1.568590E+03	1.568599E+03	1.568590E+01
46.12500	34.90000	5.597694E+00	1.561768E+03	1.561778E+03	1.561768E+01
46.25000	34.90000	5.863570E+00	1.554540E+03	1.554551E+03	1.554540E+01
46.37500	34.90000	6.061254E+00	1.547171E+03	1.547182E+03	1.547171E+01
46.50000	34.90000	6.338452E+00	1.539421E+03	1.539434E+03	1.539421E+01
46.62500	34.90000	6.522381E+00	1.531373E+03	1.531387E+03	1.531373E+01
46.75000	34.90000	6.797755E+00	1.523048E+03	1.523063E+03	1.523048E+01
46.87500	34.90000	6.992228E+00	1.514334E+03	1.514350E+03	1.514334E+01
47.00000	34.90000	7.254960E+00	1.505485E+03	1.505502E+03	1.505485E+01
47.12500	34.90000	7.528823E+00	1.496245E+03	1.496264E+03	1.496245E+01
47.25000	34.90000	7.710483E+00	1.486738E+03	1.486758E+03	1.486738E+01
47.37500	34.90000	7.983447E+00	1.476930E+03	1.476951E+03	1.476930E+01
47.50000	34.90000	8.164877E+00	1.466815E+03	1.466837E+03	1.466815E+01
47.62500	34.90000	8.437924E+00	1.456438E+03	1.456462E+03	1.456438E+01
47.75000	34.90000	8.699976E+00	1.445671E+03	1.445697E+03	1.445671E+01
47.87500	34.90000	8.893422E+00	1.434771E+03	1.434798E+03	1.434771E+01
48.00000	34.90000	9.168001E+00	1.423482E+03	1.423512E+03	1.423482E+01
48.12500	34.90000	9.351364E+00	1.411925E+03	1.411956E+03	1.411925E+01
48.25000	34.90000	9.629533E+00	1.400062E+03	1.400095E+03	1.400062E+01
48.37500	34.90000	9.829409E+00	1.387823E+03	1.387858E+03	1.387823E+01
48.50000	34.90000	1.009806E+01	1.375449E+03	1.375486E+03	1.375449E+01
48.62500	34.90000	1.038270E+01	1.362648E+03	1.362688E+03	1.362648E+01
48.75000	34.90000	1.057660E+01	1.349623E+03	1.349665E+03	1.349623E+01
48.87500	34.90000	1.087175E+01	1.336218E+03	1.336262E+03	1.336218E+01
49.00000	34.90000	1.106873E+01	1.322556E+03	1.322602E+03	1.322556E+01
49.12500	34.90000	1.138010E+01	1.308525E+03	1.308575E+03	1.308525E+01
49.25000	34.90000	1.169400E+01	1.294094E+03	1.294147E+03	1.294094E+01
49.37500	34.90000	1.191434E+01	1.279521E+03	1.279577E+03	1.279521E+01
49.50000	34.90000	1.225030E+01	1.264418E+03	1.264478E+03	1.264418E+01
49.62500	34.90000	1.248253E+01	1.249136E+03	1.249199E+03	1.249136E+01
49.75000	34.90000	1.285580E+01	1.233300E+03	1.233367E+03	1.233300E+01
49.87500	34.90000	1.314392E+01	1.217048E+03	1.217119E+03	1.217048E+01
50.00000	34.90000	1.352488E+01	1.200642E+03	1.200718E+03	1.200642E+01
50.12500	34.90000	1.395603E+01	1.183466E+03	1.183549E+03	1.183466E+01
50.25000	34.90000	1.428008E+01	1.166307E+03	1.166395E+03	1.166307E+01

Button C, Horizontal Offset = 10mm

Los Alamos National Laboratory Poisson Superfish
Program SF7 written by James H. Billen and Lloyd M. Young

The original Poisson Superfish codes were developed by
Ron F. Holsinger in collaboration with Klaus Halbach.
These programs are provided as a service to the accelerator
community by the Los Alamos Accelerator Code Group (LAACG).

Program SF7 6.10 released 7-18-2001

SF.INI file: H:\LANL\SF.INI 8-03-2001 14:32:36
Starting from file BPM.T35 dump 1.
Memory used for BPM.T35 arrays: 1.579 M
Reading keyword commands and data from file:
BUTTON3.TXT.

Electric fields along a straight line with end points at:
(X1, Y1) = (17.75000, 3.00000)
(X2, Y2) = (30.25000, 3.00000)
Number of increments: 100

X (mm)	Y (mm)	Ex (V/cm)	Ey (V/cm)	|E| (V/cm)	V (V)
17.75000	3.000000	-1.931044E-14	-2.128410E+02	2.128410E+02	1.181505E-14
17.87500	3.000000	-1.912007E-14	-2.171015E+02	2.171015E+02	1.205156E-14
18.00000	3.000000	-1.906770E-14	-2.213677E+02	2.213677E+02	1.228837E-14
18.12500	3.000000	-1.894590E-14	-2.256361E+02	2.256361E+02	1.252532E-14
18.25000	3.000000	-1.890850E-14	-2.298626E+02	2.298626E+02	1.275994E-14
18.37500	3.000000	-1.888020E-14	-2.340970E+02	2.340970E+02	1.299499E-14
18.50000	3.000000	-1.886694E-14	-2.383242E+02	2.383242E+02	1.322965E-14
18.62500	3.000000	-1.888681E-14	-2.425606E+02	2.425606E+02	1.346482E-14
18.75000	3.000000	-1.889159E-14	-2.467920E+02	2.467920E+02	1.369971E-14
18.87500	3.000000	-1.894673E-14	-2.510490E+02	2.510490E+02	1.393602E-14
19.00000	3.000000	-1.898187E-14	-2.553065E+02	2.553065E+02	1.417236E-14
19.12500	3.000000	-1.904518E-14	-2.595736E+02	2.595736E+02	1.440923E-14
19.25000	3.000000	-1.910493E-14	-2.638580E+02	2.638580E+02	1.464706E-14
19.37500	3.000000	-1.918418E-14	-2.681580E+02	2.681580E+02	1.488576E-14
19.50000	3.000000	-1.926576E-14	-2.724826E+02	2.724826E+02	1.512582E-14
19.62500	3.000000	-1.937053E-14	-2.768298E+02	2.768298E+02	1.536714E-14
19.75000	3.000000	-1.948492E-14	-2.811919E+02	2.811919E+02	1.560928E-14
19.87500	3.000000	-1.957522E-14	-2.855817E+02	2.855817E+02	1.585297E-14
20.00000	3.000000	-1.969772E-14	-2.899949E+02	2.899949E+02	1.609795E-14

20.12500	3.000000	-1.980615E-14	-2.944395E+02	2.944395E+02	1.634468E-14
20.25000	3.000000	-1.993526E-14	-2.989061E+02	2.989061E+02	1.659262E-14
20.37500	3.000000	-2.010167E-14	-3.034125E+02	3.034125E+02	1.684278E-14
20.50000	3.000000	-2.021720E-14	-3.079427E+02	3.079427E+02	1.709426E-14
20.62500	3.000000	-2.037183E-14	-3.125049E+02	3.125049E+02	1.734751E-14
20.75000	3.000000	-2.049929E-14	-3.171014E+02	3.171014E+02	1.760266E-14
20.87500	3.000000	-2.066187E-14	-3.217305E+02	3.217305E+02	1.785963E-14
21.00000	3.000000	-2.080122E-14	-3.264001E+02	3.264001E+02	1.811884E-14
21.12500	3.000000	-2.099241E-14	-3.311040E+02	3.311040E+02	1.837996E-14
21.25000	3.000000	-2.117456E-14	-3.358428E+02	3.358428E+02	1.864302E-14
21.37500	3.000000	-2.131905E-14	-3.406206E+02	3.406206E+02	1.890824E-14
21.50000	3.000000	-2.150618E-14	-3.454368E+02	3.454368E+02	1.917560E-14
21.62500	3.000000	-2.166217E-14	-3.502967E+02	3.502967E+02	1.944537E-14
21.75000	3.000000	-2.185322E-14	-3.551919E+02	3.551919E+02	1.971711E-14
21.87500	3.000000	-2.208235E-14	-3.601378E+02	3.601378E+02	1.999166E-14
22.00000	3.000000	-2.224308E-14	-3.651187E+02	3.651187E+02	2.026816E-14
22.12500	3.000000	-2.245131E-14	-3.701448E+02	3.701448E+02	2.054716E-14
22.25000	3.000000	-2.262007E-14	-3.752153E+02	3.752153E+02	2.082863E-14
22.37500	3.000000	-2.283389E-14	-3.803295E+02	3.803295E+02	2.111253E-14
22.50000	3.000000	-2.301147E-14	-3.854946E+02	3.854946E+02	2.139925E-14
22.62500	3.000000	-2.325802E-14	-3.907028E+02	3.907028E+02	2.168836E-14
22.75000	3.000000	-2.348610E-14	-3.959579E+02	3.959579E+02	2.198008E-14
22.87500	3.000000	-2.366764E-14	-4.012600E+02	4.012600E+02	2.227441E-14
23.00000	3.000000	-2.389957E-14	-4.066112E+02	4.066112E+02	2.257146E-14
23.12500	3.000000	-2.408972E-14	-4.120148E+02	4.120148E+02	2.287142E-14
23.25000	3.000000	-2.432461E-14	-4.174631E+02	4.174631E+02	2.317386E-14
23.37500	3.000000	-2.460007E-14	-4.229710E+02	4.229710E+02	2.347961E-14
23.50000	3.000000	-2.479398E-14	-4.285214E+02	4.285214E+02	2.378771E-14
23.62500	3.000000	-2.504244E-14	-4.341268E+02	4.341268E+02	2.409888E-14
23.75000	3.000000	-2.524272E-14	-4.397844E+02	4.397844E+02	2.441294E-14
23.87500	3.000000	-2.549552E-14	-4.454944E+02	4.454944E+02	2.472991E-14
24.00000	3.000000	-2.570302E-14	-4.512633E+02	4.512633E+02	2.505014E-14
24.12500	3.000000	-2.599244E-14	-4.570825E+02	4.570825E+02	2.537317E-14
24.25000	3.000000	-2.625659E-14	-4.629578E+02	4.629578E+02	2.569932E-14
24.37500	3.000000	-2.646716E-14	-4.688863E+02	4.688863E+02	2.602842E-14
24.50000	3.000000	-2.673454E-14	-4.748723E+02	4.748723E+02	2.636071E-14
24.62500	3.000000	-2.695204E-14	-4.809176E+02	4.809176E+02	2.669629E-14
24.75000	3.000000	-2.722151E-14	-4.870153E+02	4.870153E+02	2.703478E-14
24.87500	3.000000	-2.753394E-14	-4.931799E+02	4.931799E+02	2.737699E-14
25.00000	3.000000	-2.775455E-14	-4.993927E+02	4.993927E+02	2.772186E-14
25.12500	3.000000	-2.803534E-14	-5.056685E+02	5.056685E+02	2.807024E-14
25.25000	3.000000	-2.826026E-14	-5.120028E+02	5.120028E+02	2.842186E-14
25.37500	3.000000	-2.854400E-14	-5.183964E+02	5.183964E+02	2.877678E-14
25.50000	3.000000	-2.877501E-14	-5.248549E+02	5.248549E+02	2.913530E-14
25.62500	3.000000	-2.906018E-14	-5.313673E+02	5.313673E+02	2.949681E-14
25.75000	3.000000	-2.939031E-14	-5.379481E+02	5.379481E+02	2.986212E-14
25.87500	3.000000	-2.962372E-14	-5.445840E+02	5.445840E+02	3.023048E-14
26.00000	3.000000	-2.991830E-14	-5.512845E+02	5.512845E+02	3.060244E-14
26.12500	3.000000	-3.015658E-14	-5.580491E+02	5.580491E+02	3.097795E-14
26.25000	3.000000	-3.045253E-14	-5.648725E+02	5.648725E+02	3.135672E-14
26.37500	3.000000	-3.069433E-14	-5.717666E+02	5.717666E+02	3.173942E-14
26.50000	3.000000	-3.103278E-14	-5.787156E+02	5.787156E+02	3.212517E-14
26.62500	3.000000	-3.133611E-14	-5.857330E+02	5.857330E+02	3.251471E-14
26.75000	3.000000	-3.157939E-14	-5.928123E+02	5.928123E+02	3.290769E-14
26.87500	3.000000	-3.188482E-14	-5.999567E+02	5.999567E+02	3.330429E-14
27.00000	3.000000	-3.213177E-14	-6.071697E+02	6.071697E+02	3.370469E-14

27.12500	3.000000	-3.243774E-14	-6.144417E+02	6.144417E+02	3.410837E-14
27.25000	3.000000	-3.278775E-14	-6.217856E+02	6.217856E+02	3.451604E-14
27.37500	3.000000	-3.303590E-14	-6.291878E+02	6.291878E+02	3.492694E-14
27.50000	3.000000	-3.334684E-14	-6.366594E+02	6.366594E+02	3.534170E-14
27.62500	3.000000	-3.359610E-14	-6.441970E+02	6.441970E+02	3.576012E-14
27.75000	3.000000	-3.390816E-14	-6.517989E+02	6.517989E+02	3.618211E-14
27.87500	3.000000	-3.415962E-14	-6.594730E+02	6.594730E+02	3.660810E-14
28.00000	3.000000	-3.451276E-14	-6.672042E+02	6.672042E+02	3.703727E-14
28.12500	3.000000	-3.482550E-14	-6.750078E+02	6.750078E+02	3.747046E-14
28.25000	3.000000	-3.507699E-14	-6.828739E+02	6.828739E+02	3.790712E-14
28.37500	3.000000	-3.539052E-14	-6.908082E+02	6.908082E+02	3.834756E-14
28.50000	3.000000	-3.564193E-14	-6.988117E+02	6.988117E+02	3.879184E-14
28.62500	3.000000	-3.595454E-14	-7.068768E+02	7.068768E+02	3.923955E-14
28.75000	3.000000	-3.630701E-14	-7.150134E+02	7.150134E+02	3.969122E-14
28.87500	3.000000	-3.655800E-14	-7.232087E+02	7.232087E+02	4.014615E-14
29.00000	3.000000	-3.686905E-14	-7.314752E+02	7.314752E+02	4.060503E-14
29.12500	3.000000	-3.711742E-14	-7.398067E+02	7.398067E+02	4.106752E-14
29.25000	3.000000	-3.742703E-14	-7.482031E+02	7.482031E+02	4.153362E-14
29.37500	3.000000	-3.767346E-14	-7.566696E+02	7.566696E+02	4.200360E-14
29.50000	3.000000	-3.802107E-14	-7.651920E+02	7.651920E+02	4.247669E-14
29.62500	3.000000	-3.832348E-14	-7.737871E+02	7.737871E+02	4.295381E-14
29.75000	3.000000	-3.856782E-14	-7.824411E+02	7.824411E+02	4.343420E-14
29.87500	3.000000	-3.886884E-14	-7.911623E+02	7.911623E+02	4.391833E-14
30.00000	3.000000	-3.910755E-14	-7.999484E+02	7.999484E+02	4.440606E-14
30.12500	3.000000	-3.940541E-14	-8.087950E+02	8.087950E+02	4.489714E-14
30.25000	3.000000	-3.973421E-14	-8.177067E+02	8.177067E+02	4.539184E-14

Button D, Horizontal Offset = 10mm

Los Alamos National Laboratory Poisson Superfish
Program SF7 written by James H. Billen and Lloyd M. Young

The original Poisson Superfish codes were developed by
Ron F. Holsinger in collaboration with Klaus Halbach.
These programs are provided as a service to the accelerator
community by the Los Alamos Accelerator Code Group (LAACG).

Program SF7 6.10 released 7-18-2001

SF.INI file: H:\LANL\SF.INI 8-03-2001 14:32:36
Starting from file BPM.T35 dump 1.
Memory used for BPM.T35 arrays: 1.579 M
Reading keyword commands and data from file:
BUTTON4.TXT.

Electric fields along a straight line with end points at:
(X1, Y1) = (37.75000, 3.00000)
(X2, Y2) = (50.25000, 3.00000)
Number of increments: 100

X (mm)	Y (mm)	Ex (V/cm)	Ey (V/cm)	|E| (V/cm)	V (V)
37.75000	3.000000	-4.063248E-14	-1.409421E+03	1.409421E+03	7.823858E-14
37.87500	3.000000	-4.009657E-14	-1.418517E+03	1.418517E+03	7.874353E-14
38.00000	3.000000	-3.955622E-14	-1.427527E+03	1.427527E+03	7.924367E-14
38.12500	3.000000	-3.913463E-14	-1.436416E+03	1.436416E+03	7.973708E-14
38.25000	3.000000	-3.856780E-14	-1.445195E+03	1.445195E+03	8.022443E-14
38.37500	3.000000	-3.808194E-14	-1.453836E+03	1.453836E+03	8.070411E-14
38.50000	3.000000	-3.749113E-14	-1.462375E+03	1.462375E+03	8.117814E-14
38.62500	3.000000	-3.674286E-14	-1.470740E+03	1.470740E+03	8.164244E-14
38.75000	3.000000	-3.622766E-14	-1.478997E+03	1.478997E+03	8.210083E-14
38.87500	3.000000	-3.553156E-14	-1.487112E+03	1.487112E+03	8.255128E-14
39.00000	3.000000	-3.496133E-14	-1.495075E+03	1.495075E+03	8.299331E-14
39.12500	3.000000	-3.422822E-14	-1.502892E+03	1.502892E+03	8.342724E-14
39.25000	3.000000	-3.359954E-14	-1.510526E+03	1.510526E+03	8.385106E-14
39.37500	3.000000	-3.273385E-14	-1.518003E+03	1.518003E+03	8.426609E-14
39.50000	3.000000	-3.189811E-14	-1.525326E+03	1.525326E+03	8.467261E-14
39.62500	3.000000	-3.124069E-14	-1.532470E+03	1.532470E+03	8.506915E-14
39.75000	3.000000	-3.037804E-14	-1.539439E+03	1.539439E+03	8.545602E-14
39.87500	3.000000	-2.965588E-14	-1.546205E+03	1.546205E+03	8.583162E-14
40.00000	3.000000	-2.877002E-14	-1.552811E+03	1.552811E+03	8.619833E-14
40.12500	3.000000	-2.769116E-14	-1.559173E+03	1.559173E+03	8.655151E-14
40.25000	3.000000	-2.694071E-14	-1.565375E+03	1.565375E+03	8.689579E-14
40.37500	3.000000	-2.595278E-14	-1.571367E+03	1.571367E+03	8.722838E-14
40.50000	3.000000	-2.515089E-14	-1.577146E+03	1.577146E+03	8.754918E-14
40.62500	3.000000	-2.412908E-14	-1.582718E+03	1.582718E+03	8.785850E-14
40.75000	3.000000	-2.327310E-14	-1.588043E+03	1.588043E+03	8.815411E-14
40.87500	3.000000	-2.208649E-14	-1.593158E+03	1.593158E+03	8.843804E-14
41.00000	3.000000	-2.097411E-14	-1.598052E+03	1.598052E+03	8.870969E-14
41.12500	3.000000	-2.009369E-14	-1.602713E+03	1.602713E+03	8.896846E-14
41.25000	3.000000	-1.895837E-14	-1.607138E+03	1.607138E+03	8.921408E-14
41.37500	3.000000	-1.802322E-14	-1.611302E+03	1.611302E+03	8.944525E-14
41.50000	3.000000	-1.686976E-14	-1.615251E+03	1.615251E+03	8.966443E-14
41.62500	3.000000	-1.550351E-14	-1.618899E+03	1.618899E+03	8.986696E-14
41.75000	3.000000	-1.454621E-14	-1.622339E+03	1.622339E+03	9.005789E-14
41.87500	3.000000	-1.330654E-14	-1.625510E+03	1.625510E+03	9.023394E-14
42.00000	3.000000	-1.231484E-14	-1.628414E+03	1.628414E+03	9.039511E-14
42.12500	3.000000	-1.105497E-14	-1.631061E+03	1.631061E+03	9.054205E-14
42.25000	3.000000	-1.001829E-14	-1.633411E+03	1.633411E+03	9.067251E-14
42.37500	3.000000	-8.573282E-15	-1.635510E+03	1.635510E+03	9.078907E-14
42.50000	3.000000	-7.251157E-15	-1.637331E+03	1.637331E+03	9.089012E-14
42.62500	3.000000	-6.199122E-15	-1.638882E+03	1.638882E+03	9.097623E-14
42.75000	3.000000	-4.862023E-15	-1.640147E+03	1.640147E+03	9.104647E-14
42.87500	3.000000	-3.774815E-15	-1.641113E+03	1.641113E+03	9.110005E-14
43.00000	3.000000	-2.428477E-15	-1.641818E+03	1.641818E+03	9.113923E-14
43.12500	3.000000	-1.318361E-15	-1.642191E+03	1.642191E+03	9.115994E-14
43.25000	3.000000	2.304085E-16	-1.642319E+03	1.642319E+03	9.116701E-14
43.37500	3.000000	1.625561E-15	-1.642135E+03	1.642135E+03	9.115678E-14
43.50000	3.000000	2.742901E-15	-1.641656E+03	1.641656E+03	9.113024E-14
43.62500	3.000000	4.148314E-15	-1.640886E+03	1.640886E+03	9.108748E-14

43.75000	3.000000	5.287793E-15	-1.639791E+03	1.639791E+03	9.102671E-14
43.87500	3.000000	6.883954E-15	-1.638425E+03	1.638425E+03	9.095087E-14
44.00000	3.000000	8.313882E-15	-1.636742E+03	1.636742E+03	9.085745E-14
44.12500	3.000000	9.457119E-15	-1.634774E+03	1.634774E+03	9.074820E-14
44.25000	3.000000	1.089243E-14	-1.632493E+03	1.632493E+03	9.062157E-14
44.37500	3.000000	1.204709E-14	-1.629896E+03	1.629896E+03	9.047741E-14
44.50000	3.000000	1.348138E-14	-1.627016E+03	1.627016E+03	9.031755E-14
44.62500	3.000000	1.464203E-14	-1.623792E+03	1.623792E+03	9.013856E-14
44.75000	3.000000	1.626947E-14	-1.620314E+03	1.620314E+03	8.994552E-14
44.87500	3.000000	1.771268E-14	-1.616502E+03	1.616502E+03	8.973387E-14
45.00000	3.000000	1.886932E-14	-1.612391E+03	1.612391E+03	8.950569E-14
45.12500	3.000000	2.031312E-14	-1.607976E+03	1.607976E+03	8.926060E-14
45.25000	3.000000	2.147029E-14	-1.603233E+03	1.603233E+03	8.899733E-14
45.37500	3.000000	2.290785E-14	-1.598217E+03	1.598217E+03	8.871885E-14
45.50000	3.000000	2.453403E-14	-1.592873E+03	1.592873E+03	8.842222E-14
45.62500	3.000000	2.568486E-14	-1.587247E+03	1.587247E+03	8.810992E-14
45.75000	3.000000	2.711866E-14	-1.581305E+03	1.581305E+03	8.778005E-14
45.87500	3.000000	2.826141E-14	-1.575053E+03	1.575053E+03	8.743299E-14
46.00000	3.000000	2.968890E-14	-1.568513E+03	1.568513E+03	8.706998E-14
46.12500	3.000000	3.082877E-14	-1.561639E+03	1.561639E+03	8.668840E-14
46.25000	3.000000	3.243317E-14	-1.554518E+03	1.554518E+03	8.629308E-14
46.37500	3.000000	3.384508E-14	-1.547064E+03	1.547064E+03	8.587929E-14
46.50000	3.000000	3.497471E-14	-1.539322E+03	1.539322E+03	8.544951E-14
46.62500	3.000000	3.638286E-14	-1.531281E+03	1.531281E+03	8.500320E-14
46.75000	3.000000	3.750549E-14	-1.522925E+03	1.522925E+03	8.453930E-14
46.87500	3.000000	3.890454E-14	-1.514301E+03	1.514301E+03	8.406061E-14
47.00000	3.000000	4.048419E-14	-1.505361E+03	1.505361E+03	8.356434E-14
47.12500	3.000000	4.159794E-14	-1.496148E+03	1.496148E+03	8.305292E-14
47.25000	3.000000	4.299176E-14	-1.486630E+03	1.486630E+03	8.252452E-14
47.37500	3.000000	4.410048E-14	-1.476811E+03	1.476811E+03	8.197950E-14
47.50000	3.000000	4.549138E-14	-1.466716E+03	1.466716E+03	8.141909E-14
47.62500	3.000000	4.660589E-14	-1.456294E+03	1.456294E+03	8.084054E-14
47.75000	3.000000	4.817508E-14	-1.445625E+03	1.445625E+03	8.024829E-14
47.87500	3.000000	4.957818E-14	-1.434640E+03	1.434640E+03	7.963854E-14
48.00000	3.000000	5.068939E-14	-1.423366E+03	1.423366E+03	7.901269E-14
48.12500	3.000000	5.209896E-14	-1.411803E+03	1.411803E+03	7.837081E-14
48.25000	3.000000	5.323368E-14	-1.399919E+03	1.399919E+03	7.771112E-14
48.37500	3.000000	5.464694E-14	-1.387778E+03	1.387778E+03	7.703714E-14
48.50000	3.000000	5.630015E-14	-1.375292E+03	1.375292E+03	7.634404E-14
48.62500	3.000000	5.744233E-14	-1.362534E+03	1.362534E+03	7.563585E-14
48.75000	3.000000	5.893310E-14	-1.349469E+03	1.349469E+03	7.491059E-14
48.87500	3.000000	6.012499E-14	-1.336083E+03	1.336083E+03	7.416750E-14
49.00000	3.000000	6.165646E-14	-1.322407E+03	1.322407E+03	7.340831E-14
49.12500	3.000000	6.293065E-14	-1.308357E+03	1.308357E+03	7.262838E-14
49.25000	3.000000	6.471184E-14	-1.293998E+03	1.293998E+03	7.183133E-14
49.37500	3.000000	6.645056E-14	-1.279339E+03	1.279339E+03	7.101757E-14
49.50000	3.000000	6.776803E-14	-1.264295E+03	1.264295E+03	7.018246E-14
49.62500	3.000000	6.958016E-14	-1.248932E+03	1.248932E+03	6.932964E-14
49.75000	3.000000	7.110645E-14	-1.233137E+03	1.233137E+03	6.845285E-14
49.87500	3.000000	7.300377E-14	-1.217065E+03	1.217065E+03	6.756067E-14
50.00000	3.000000	7.557679E-14	-1.200397E+03	1.200397E+03	6.663543E-14
50.12500	3.000000	7.719707E-14	-1.183386E+03	1.183386E+03	6.569114E-14
50.25000	3.000000	8.010848E-14	-1.166138E+03	1.166138E+03	6.473367E-14

Button A, Vertical Offset = 10mm

Los Alamos National Laboratory Poisson Superfish
Program SF7 written by James H. Billen and Lloyd M. Young

The original Poisson Superfish codes were developed by
Ron F. Holsinger in collaboration with Klaus Halbach.
These programs are provided as a service to the accelerator
community by the Los Alamos Accelerator Code Group (LAACG).

Program SF7 6.10 released 7-18-2001

SF.INI file: H:\LANL\SF.INI 8-03-2001 14:32:36
Starting from file BPM.T35 dump 1.
Memory used for BPM.T35 arrays: 1.579 M
Reading keyword commands and data from file:
BUTTON1.TXT.

Electric fields along a straight line with end points at:
(X1, Y1) = (17.75000, 34.40000)
(X2, Y2) = (30.25000, 34.90000)
Number of increments: 100

X (mm)	Y (mm)	Ex (V/cm)	Ey (V/cm)	|E| (V/cm)	V (V)
17.75000	34.40000	-5.599936E+01	4.837449E+02	4.869754E+02	2.902469E+01
17.87500	34.40500	-5.562136E+01	4.952172E+02	4.983310E+02	2.946542E+01
18.00000	34.41000	-5.574876E+01	5.069653E+02	5.100213E+02	2.991095E+01
18.12500	34.41500	-5.586609E+01	5.188395E+02	5.218385E+02	3.035211E+01
18.25000	34.42000	-5.567953E+01	5.305997E+02	5.335131E+02	3.077478E+01
18.37500	34.42500	-5.601668E+01	5.426884E+02	5.455718E+02	3.120458E+01
18.50000	34.43000	-5.576334E+01	5.547494E+02	5.575450E+02	3.162072E+01
18.62500	34.43500	-5.627203E+01	5.670886E+02	5.698737E+02	3.204051E+01
18.75000	34.44000	-5.597339E+01	5.795078E+02	5.822047E+02	3.245244E+01
18.87500	34.44500	-5.662362E+01	5.921313E+02	5.948325E+02	3.286329E+01
19.00000	34.45000	-5.725312E+01	6.050139E+02	6.077168E+02	3.327576E+01
19.12500	34.45500	-5.705960E+01	6.179018E+02	6.205308E+02	3.367565E+01
19.25000	34.46000	-5.780847E+01	6.311361E+02	6.337781E+02	3.408135E+01
19.37500	34.46500	-5.756819E+01	6.444818E+02	6.470478E+02	3.447978E+01
19.50000	34.47000	-5.842395E+01	6.580967E+02	6.606849E+02	3.487912E+01
19.62500	34.47500	-5.925342E+01	6.720403E+02	6.746474E+02	3.528211E+01
19.75000	34.48000	-5.909301E+01	6.859755E+02	6.885161E+02	3.567073E+01
19.87500	34.48500	-6.001828E+01	7.003618E+02	7.029287E+02	3.606863E+01
20.00000	34.49000	-5.980884E+01	7.148525E+02	7.173501E+02	3.645748E+01
20.12500	34.49500	-6.082443E+01	7.297098E+02	7.322404E+02	3.685034E+01
20.25000	34.50000	-6.056488E+01	7.448087E+02	7.472671E+02	3.724043E+01

20.37500	34.50500	-6.166728E+01	7.601655E+02	7.626628E+02	3.762819E+01
20.50000	34.51000	-6.273516E+01	7.759537E+02	7.784857E+02	3.802173E+01
20.62500	34.51500	-6.254188E+01	7.918124E+02	7.942786E+02	3.840290E+01
20.75000	34.52000	-6.369162E+01	8.081651E+02	8.106710E+02	3.879193E+01
20.87500	34.52500	-6.344327E+01	8.247368E+02	8.271734E+02	3.917500E+01
21.00000	34.53000	-6.467367E+01	8.416848E+02	8.441658E+02	3.955919E+01
21.12500	34.53500	-6.586368E+01	8.591377E+02	8.616586E+02	3.994990E+01
21.25000	34.54000	-6.567688E+01	8.766034E+02	8.790602E+02	4.032375E+01
21.37500	34.54500	-6.694394E+01	8.947224E+02	8.972234E+02	4.070987E+01
21.50000	34.55000	-6.669669E+01	9.130157E+02	9.154486E+02	4.108571E+01
21.62500	34.55500	-6.804069E+01	9.318354E+02	9.343162E+02	4.146668E+01
21.75000	34.56000	-6.772820E+01	9.510216E+02	9.534302E+02	4.184495E+01
21.87500	34.56500	-6.914940E+01	9.705773E+02	9.730375E+02	4.222011E+01
22.00000	34.57000	-7.052023E+01	9.907626E+02	9.932692E+02	4.260279E+01
22.12500	34.57500	-7.026521E+01	1.011054E+03	1.013493E+03	4.296981E+01
22.25000	34.58000	-7.170993E+01	1.032059E+03	1.034547E+03	4.334646E+01
22.37500	34.58500	-7.138294E+01	1.053379E+03	1.055794E+03	4.371521E+01
22.50000	34.59000	-7.290179E+01	1.075242E+03	1.077711E+03	4.408493E+01
22.62500	34.59500	-7.402359E+01	1.097947E+03	1.100439E+03	4.446685E+01
22.75000	34.60000	-7.409024E+01	1.120433E+03	1.122880E+03	4.481732E+01
22.87500	34.60500	-7.521726E+01	1.144147E+03	1.146617E+03	4.519382E+01
23.00000	34.61000	-7.547550E+01	1.168694E+03	1.171128E+03	4.557905E+01
23.12500	34.61500	-7.687004E+01	1.192299E+03	1.194775E+03	4.590352E+01
23.25000	34.62000	-7.704263E+01	1.217706E+03	1.220141E+03	4.627283E+01
23.37500	34.62500	-7.810235E+01	1.242939E+03	1.245391E+03	4.661023E+01
23.50000	34.63000	-7.929258E+01	1.269589E+03	1.272062E+03	4.697478E+01
23.62500	34.63500	-7.949968E+01	1.297125E+03	1.299559E+03	4.734508E+01
23.75000	34.64000	-8.104039E+01	1.324768E+03	1.327245E+03	4.769166E+01
23.87500	34.64500	-8.112892E+01	1.352199E+03	1.354631E+03	4.800307E+01
24.00000	34.65000	-8.231447E+01	1.381753E+03	1.384202E+03	4.836135E+01
24.12500	34.65500	-8.230471E+01	1.410610E+03	1.413010E+03	4.866606E+01
24.25000	34.66000	-8.356939E+01	1.441599E+03	1.444020E+03	4.901438E+01
24.37500	34.66500	-8.514235E+01	1.472802E+03	1.475261E+03	4.933888E+01
24.50000	34.67000	-8.477189E+01	1.504393E+03	1.506780E+03	4.964498E+01
24.62500	34.67500	-8.636780E+01	1.537013E+03	1.539438E+03	4.995294E+01
24.75000	34.68000	-8.632787E+01	1.569486E+03	1.571859E+03	5.022356E+01
24.87500	34.68500	-8.752635E+01	1.604454E+03	1.606840E+03	5.054031E+01
25.00000	34.69000	-8.860352E+01	1.638600E+03	1.640994E+03	5.079661E+01
25.12500	34.69500	-8.863725E+01	1.675351E+03	1.677694E+03	5.109821E+01
25.25000	34.70000	-9.020365E+01	1.712259E+03	1.714633E+03	5.136776E+01
25.37500	34.70500	-8.964266E+01	1.749805E+03	1.752100E+03	5.161925E+01
25.50000	34.71000	-9.120190E+01	1.788407E+03	1.790731E+03	5.186381E+01
25.62500	34.71500	-9.096753E+01	1.826973E+03	1.829236E+03	5.206872E+01
25.75000	34.72000	-9.210481E+01	1.868472E+03	1.870741E+03	5.231721E+01
25.87500	34.72500	-9.357495E+01	1.910249E+03	1.912539E+03	5.253183E+01
26.00000	34.73000	-9.286701E+01	1.952558E+03	1.954766E+03	5.271908E+01
26.12500	34.73500	-9.429679E+01	1.996249E+03	1.998475E+03	5.290059E+01
26.25000	34.74000	-9.347593E+01	2.040916E+03	2.043056E+03	5.306382E+01
26.37500	34.74500	-9.483245E+01	2.089020E+03	2.091171E+03	5.327001E+01
26.50000	34.75000	-9.614880E+01	2.133879E+03	2.136044E+03	5.334698E+01
26.62500	34.75500	-9.542121E+01	2.184006E+03	2.186090E+03	5.350816E+01
26.75000	34.76000	-9.644047E+01	2.230890E+03	2.232973E+03	5.354135E+01
26.87500	34.76500	-9.540547E+01	2.281139E+03	2.283133E+03	5.360676E+01
27.00000	34.77000	-9.635424E+01	2.335337E+03	2.337324E+03	5.371275E+01
27.12500	34.77500	-9.611334E+01	2.388488E+03	2.390421E+03	5.374099E+01
27.25000	34.78000	-9.637046E+01	2.442228E+03	2.444128E+03	5.372901E+01

27.37500	34.78500	-9.715652E+01	2.495095E+03	2.496986E+03	5.364455E+01
27.50000	34.79000	-9.609582E+01	2.554190E+03	2.555997E+03	5.363799E+01
27.62500	34.79500	-9.625270E+01	2.612135E+03	2.613908E+03	5.354877E+01
27.75000	34.80000	-9.560420E+01	2.671608E+03	2.673318E+03	5.343216E+01
27.87500	34.80500	-9.547007E+01	2.731789E+03	2.733457E+03	5.326989E+01
28.00000	34.81000	-9.521140E+01	2.793960E+03	2.795582E+03	5.308524E+01
28.12500	34.81500	-9.430482E+01	2.856747E+03	2.858304E+03	5.284983E+01
28.25000	34.82000	-9.393057E+01	2.921222E+03	2.922732E+03	5.258199E+01
28.37500	34.82500	-9.272711E+01	2.987032E+03	2.988471E+03	5.227306E+01
28.50000	34.83000	-9.209587E+01	3.054008E+03	3.055396E+03	5.191813E+01
28.62500	34.83500	-9.074521E+01	3.122692E+03	3.124011E+03	5.152442E+01
28.75000	34.84000	-8.978545E+01	3.192036E+03	3.193298E+03	5.107257E+01
28.87500	34.84500	-8.861216E+01	3.263269E+03	3.264471E+03	5.058066E+01
29.00000	34.85000	-8.697549E+01	3.335158E+03	3.336292E+03	5.002737E+01
29.12500	34.85500	-8.561621E+01	3.408301E+03	3.409376E+03	4.942037E+01
29.25000	34.86000	-8.364827E+01	3.483126E+03	3.484130E+03	4.876376E+01
29.37500	34.86500	-8.193766E+01	3.558403E+03	3.559346E+03	4.803844E+01
29.50000	34.87000	-7.993259E+01	3.635333E+03	3.636212E+03	4.725933E+01
29.62500	34.87500	-7.770609E+01	3.712786E+03	3.713599E+03	4.640983E+01
29.75000	34.88000	-7.554023E+01	3.790983E+03	3.791736E+03	4.549180E+01
29.87500	34.88500	-7.292755E+01	3.870892E+03	3.871579E+03	4.451525E+01
30.00000	34.89000	-7.038859E+01	3.950520E+03	3.951147E+03	4.345572E+01
30.12500	34.89500	-6.746860E+01	4.031415E+03	4.031980E+03	4.232986E+01
30.25000	34.90000	-6.470863E+01	4.112686E+03	4.113195E+03	4.112686E+01

Button B, Vertical Offset = 10mm

Los Alamos National Laboratory Poisson Superfish
Program SF7 written by James H. Billen and Lloyd M. Young

The original Poisson Superfish codes were developed by
Ron F. Holsinger in collaboration with Klaus Halbach.
These programs are provided as a service to the accelerator
community by the Los Alamos Accelerator Code Group (LAACG).

Program SF7 6.10 released 7-18-2001

SF.INI file: H:\LANL\SF.INI 8-03-2001 14:32:36
Starting from file BPM.T35 dump 1.
Memory used for BPM.T35 arrays: 1.579 M
Reading keyword commands and data from file:
    BUTTON2.TXT.

Electric fields along a straight line with end points at:
(X1, Y1) = (37.75000, 34.90000)
(X2, Y2) = (50.25000, 34.90000)
Number of increments: 100

X (mm)	Y (mm)	Ex (V/cm)	Ey (V/cm)	|E| (V/cm)	V (V)
37.75000	34.90000	6.470058E+01	4.112807E+03	4.113316E+03	4.112807E+01
37.87500	34.90000	6.415176E+01	4.031763E+03	4.032273E+03	4.031763E+01
38.00000	34.90000	6.397477E+01	3.950634E+03	3.951151E+03	3.950634E+01
38.12500	34.90000	6.340640E+01	3.871020E+03	3.871540E+03	3.871020E+01
38.25000	34.90000	6.293091E+01	3.791083E+03	3.791605E+03	3.791083E+01
38.37500	34.90000	6.215043E+01	3.712907E+03	3.713427E+03	3.712907E+01
38.50000	34.90000	6.147615E+01	3.635446E+03	3.635966E+03	3.635446E+01
38.62500	34.90000	6.067660E+01	3.558510E+03	3.559027E+03	3.558510E+01
38.75000	34.90000	5.976716E+01	3.483256E+03	3.483769E+03	3.483256E+01
38.87500	34.90000	5.902580E+01	3.408390E+03	3.408901E+03	3.408390E+01
39.00000	34.90000	5.796674E+01	3.335270E+03	3.335774E+03	3.335270E+01
39.12500	34.90000	5.723571E+01	3.262964E+03	3.263465E+03	3.262964E+01
39.25000	34.90000	5.609757E+01	3.192130E+03	3.192623E+03	3.192130E+01
39.37500	34.90000	5.509543E+01	3.122859E+03	3.123345E+03	3.122859E+01
39.50000	34.90000	5.415528E+01	3.054084E+03	3.054564E+03	3.054084E+01
39.62500	34.90000	5.296979E+01	2.987131E+03	2.987600E+03	2.987131E+01
39.75000	34.90000	5.216517E+01	2.921280E+03	2.921746E+03	2.921280E+01
39.87500	34.90000	5.095826E+01	2.856828E+03	2.857282E+03	2.856828E+01
40.00000	34.90000	5.009986E+01	2.794003E+03	2.794453E+03	2.794003E+01
40.12500	34.90000	4.894207E+01	2.731852E+03	2.732291E+03	2.731852E+01
40.25000	34.90000	4.795270E+01	2.671731E+03	2.672161E+03	2.671731E+01
40.37500	34.90000	4.693636E+01	2.612182E+03	2.612603E+03	2.612182E+01
40.50000	34.90000	4.574424E+01	2.554256E+03	2.554666E+03	2.554256E+01
40.62500	34.90000	4.495419E+01	2.497744E+03	2.498148E+03	2.497744E+01
40.75000	34.90000	4.378986E+01	2.442279E+03	2.442671E+03	2.442279E+01
40.87500	34.90000	4.297761E+01	2.388549E+03	2.388936E+03	2.388549E+01
41.00000	34.90000	4.187920E+01	2.335374E+03	2.335749E+03	2.335374E+01
41.12500	34.90000	4.075169E+01	2.283729E+03	2.284093E+03	2.283729E+01
41.25000	34.90000	4.001885E+01	2.233393E+03	2.233751E+03	2.233393E+01
41.37500	34.90000	3.893455E+01	2.184047E+03	2.184394E+03	2.184047E+01
41.50000	34.90000	3.808646E+01	2.136327E+03	2.136667E+03	2.136327E+01
41.62500	34.90000	3.717728E+01	2.089048E+03	2.089379E+03	2.089048E+01
41.75000	34.90000	3.636795E+01	2.043544E+03	2.043868E+03	2.043544E+01
41.87500	34.90000	3.548235E+01	1.998549E+03	1.998864E+03	1.998549E+01
42.00000	34.90000	3.449541E+01	1.954813E+03	1.955118E+03	1.954813E+01
42.12500	34.90000	3.385150E+01	1.912359E+03	1.912658E+03	1.912359E+01
42.25000	34.90000	3.291564E+01	1.870629E+03	1.870919E+03	1.870629E+01
42.37500	34.90000	3.227926E+01	1.830338E+03	1.830623E+03	1.830338E+01
42.50000	34.90000	3.140116E+01	1.790479E+03	1.790754E+03	1.790479E+01
42.62500	34.90000	3.051651E+01	1.751781E+03	1.752046E+03	1.751781E+01
42.75000	34.90000	2.995163E+01	1.714169E+03	1.714431E+03	1.714169E+01
42.87500	34.90000	2.911755E+01	1.677251E+03	1.677504E+03	1.677251E+01
43.00000	34.90000	2.848143E+01	1.641611E+03	1.641858E+03	1.641611E+01
43.12500	34.90000	2.778165E+01	1.606292E+03	1.606532E+03	1.606292E+01
43.25000	34.90000	2.718030E+01	1.572310E+03	1.572545E+03	1.572310E+01
43.37500	34.90000	2.650742E+01	1.538719E+03	1.538947E+03	1.538719E+01
43.50000	34.90000	2.577039E+01	1.506045E+03	1.506266E+03	1.506045E+01
43.62500	34.90000	2.529334E+01	1.474354E+03	1.474571E+03	1.474354E+01
43.75000	34.90000	2.460213E+01	1.443170E+03	1.443379E+03	1.443170E+01

43.87500	34.90000	2.413742E+01	1.413055E+03	1.413261E+03	1.413055E+01
44.00000	34.90000	2.349027E+01	1.383258E+03	1.383458E+03	1.383258E+01
44.12500	34.90000	2.284281E+01	1.354300E+03	1.354493E+03	1.354300E+01
44.25000	34.90000	2.243293E+01	1.326150E+03	1.326340E+03	1.326150E+01
44.37500	34.90000	2.182707E+01	1.298487E+03	1.298671E+03	1.298487E+01
44.50000	34.90000	2.142823E+01	1.271689E+03	1.271869E+03	1.271689E+01
44.62500	34.90000	2.086179E+01	1.245258E+03	1.245432E+03	1.245258E+01
44.75000	34.90000	2.043099E+01	1.219719E+03	1.219890E+03	1.219719E+01
44.87500	34.90000	1.994505E+01	1.194466E+03	1.194632E+03	1.194466E+01
45.00000	34.90000	1.941588E+01	1.169865E+03	1.170026E+03	1.169865E+01
45.12500	34.90000	1.907499E+01	1.145974E+03	1.146133E+03	1.145974E+01
45.25000	34.90000	1.858099E+01	1.122439E+03	1.122593E+03	1.122439E+01
45.37500	34.90000	1.825094E+01	1.099668E+03	1.099819E+03	1.099668E+01
45.50000	34.90000	1.778891E+01	1.077127E+03	1.077274E+03	1.077127E+01
45.62500	34.90000	1.732808E+01	1.055179E+03	1.055321E+03	1.055179E+01
45.75000	34.90000	1.703793E+01	1.033807E+03	1.033948E+03	1.033807E+01
45.87500	34.90000	1.660837E+01	1.012779E+03	1.012915E+03	1.012779E+01
46.00000	34.90000	1.632640E+01	9.923642E+02	9.924985E+02	9.923642E+00
46.12500	34.90000	1.592633E+01	9.722063E+02	9.723367E+02	9.722063E+00
46.25000	34.90000	1.556112E+01	9.526841E+02	9.528112E+02	9.526841E+00
46.37500	34.90000	1.528048E+01	9.333544E+02	9.334795E+02	9.333544E+00
46.50000	34.90000	1.490825E+01	9.144864E+02	9.146079E+02	9.144864E+00
46.62500	34.90000	1.466945E+01	8.961203E+02	8.962404E+02	8.961203E+00
46.75000	34.90000	1.432357E+01	8.779997E+02	8.781165E+02	8.779997E+00
46.87500	34.90000	1.409400E+01	8.604140E+02	8.605294E+02	8.604140E+00
47.00000	34.90000	1.377103E+01	8.429922E+02	8.431047E+02	8.429922E+00
47.12500	34.90000	1.345016E+01	8.259790E+02	8.260885E+02	8.259790E+00
47.25000	34.90000	1.324958E+01	8.093725E+02	8.094809E+02	8.093725E+00
47.37500	34.90000	1.295256E+01	7.929962E+02	7.931019E+02	7.929962E+00
47.50000	34.90000	1.275820E+01	7.770528E+02	7.771575E+02	7.770528E+00
47.62500	34.90000	1.248407E+01	7.612763E+02	7.613787E+02	7.612763E+00
47.75000	34.90000	1.223648E+01	7.459409E+02	7.460412E+02	7.459409E+00
47.87500	34.90000	1.204402E+01	7.307362E+02	7.308355E+02	7.307362E+00
48.00000	34.90000	1.179205E+01	7.158387E+02	7.159358E+02	7.158387E+00
48.12500	34.90000	1.163182E+01	7.012951E+02	7.013915E+02	7.012951E+00
48.25000	34.90000	1.140155E+01	6.868992E+02	6.869938E+02	6.868992E+00
48.37500	34.90000	1.125165E+01	6.728668E+02	6.729608E+02	6.728668E+00
48.50000	34.90000	1.103834E+01	6.589457E+02	6.590382E+02	6.589457E+00
48.62500	34.90000	1.082965E+01	6.452782E+02	6.453691E+02	6.452782E+00
48.75000	34.90000	1.070251E+01	6.319005E+02	6.319912E+02	6.319005E+00
48.87500	34.90000	1.051574E+01	6.186391E+02	6.187285E+02	6.186391E+00
49.00000	34.90000	1.039438E+01	6.056859E+02	6.057751E+02	6.056859E+00
49.12500	34.90000	1.023049E+01	5.927953E+02	5.928836E+02	5.927953E+00
49.25000	34.90000	1.009056E+01	5.801902E+02	5.802780E+02	5.801902E+00
49.37500	34.90000	9.975347E+00	5.676665E+02	5.677541E+02	5.676665E+00
49.50000	34.90000	9.836305E+00	5.552842E+02	5.553713E+02	5.552842E+00
49.62500	34.90000	9.752295E+00	5.431688E+02	5.432563E+02	5.431688E+00
49.75000	34.90000	9.641646E+00	5.310476E+02	5.311351E+02	5.310476E+00
49.87500	34.90000	9.580736E+00	5.191442E+02	5.192326E+02	5.191442E+00
50.00000	34.90000	9.487831E+00	5.073062E+02	5.073949E+02	5.073062E+00
50.12500	34.90000	9.411987E+00	4.954938E+02	4.955832E+02	4.954938E+00
50.25000	34.90000	9.382106E+00	4.839598E+02	4.840507E+02	4.839598E+00

Button C, Vertical Offset = 10mm

Los Alamos National Laboratory Poisson Superfish
Program SF7 written by James H. Billen and Lloyd M. Young

The original Poisson Superfish codes were developed by
Ron F. Holsinger in collaboration with Klaus Halbach.
These programs are provided as a service to the accelerator
community by the Los Alamos Accelerator Code Group (LAACG).

Program SF7 6.10 released 7-18-2001

SF.INI file: H:\LANL\SF.INI 8-03-2001 14:32:36
Starting from file BPM.T35 dump 1.
Memory used for BPM.T35 arrays: 1.579 M
Reading keyword commands and data from file:
BUTTON3.TXT.

Electric fields along a straight line with end points at:
(X1, Y1) = (17.75000, 3.00000)
(X2, Y2) = (30.25000, 3.00000)
Number of increments: 100

X (mm)	Y (mm)	Ex (V/cm)	Ey (V/cm)	|E| (V/cm)	V (V)
17.75000	3.000000	-1.755920E-14	-2.258640E+02	2.258640E+02	1.253797E-14
17.87500	3.000000	-1.717955E-14	-2.297043E+02	2.297043E+02	1.275115E-14
18.00000	3.000000	-1.698046E-14	-2.335086E+02	2.335086E+02	1.296233E-14
18.12500	3.000000	-1.664925E-14	-2.372831E+02	2.372831E+02	1.317186E-14
18.25000	3.000000	-1.642706E-14	-2.409735E+02	2.409735E+02	1.337672E-14
18.37500	3.000000	-1.625189E-14	-2.446341E+02	2.446341E+02	1.357992E-14
18.50000	3.000000	-1.605310E-14	-2.482493E+02	2.482493E+02	1.378061E-14
18.62500	3.000000	-1.592349E-14	-2.518320E+02	2.518320E+02	1.397949E-14
18.75000	3.000000	-1.574239E-14	-2.553752E+02	2.553752E+02	1.417617E-14
18.87500	3.000000	-1.558193E-14	-2.588991E+02	2.588991E+02	1.437179E-14
19.00000	3.000000	-1.546572E-14	-2.623880E+02	2.623880E+02	1.456546E-14
19.12500	3.000000	-1.533541E-14	-2.658451E+02	2.658451E+02	1.475737E-14
19.25000	3.000000	-1.523923E-14	-2.692779E+02	2.692779E+02	1.494793E-14
19.37500	3.000000	-1.512164E-14	-2.726870E+02	2.726870E+02	1.513717E-14
19.50000	3.000000	-1.504088E-14	-2.760737E+02	2.760737E+02	1.532517E-14
19.62500	3.000000	-1.491962E-14	-2.794451E+02	2.794451E+02	1.551232E-14
19.75000	3.000000	-1.482627E-14	-2.827877E+02	2.827877E+02	1.569787E-14
19.87500	3.000000	-1.475135E-14	-2.861147E+02	2.861147E+02	1.588256E-14
20.00000	3.000000	-1.466252E-14	-2.894216E+02	2.894216E+02	1.606613E-14
20.12500	3.000000	-1.459739E-14	-2.927113E+02	2.927113E+02	1.624874E-14
20.25000	3.000000	-1.451251E-14	-2.959835E+02	2.959835E+02	1.643038E-14

20.37500	3.000000	-1.442616E-14	-2.992410E+02	2.992410E+02	1.661121E-14
20.50000	3.000000	-1.436415E-14	-3.024824E+02	3.024824E+02	1.679115E-14
20.62500	3.000000	-1.429023E-14	-3.057064E+02	3.057064E+02	1.697012E-14
20.75000	3.000000	-1.423279E-14	-3.089158E+02	3.089158E+02	1.714827E-14
20.87500	3.000000	-1.416162E-14	-3.121106E+02	3.121106E+02	1.732562E-14
21.00000	3.000000	-1.410710E-14	-3.152902E+02	3.152902E+02	1.750212E-14
21.12500	3.000000	-1.402905E-14	-3.184577E+02	3.184577E+02	1.767795E-14
21.25000	3.000000	-1.396224E-14	-3.216088E+02	3.216088E+02	1.785287E-14
21.37500	3.000000	-1.390885E-14	-3.247471E+02	3.247471E+02	1.802709E-14
21.50000	3.000000	-1.384230E-14	-3.278712E+02	3.278712E+02	1.820051E-14
21.62500	3.000000	-1.378983E-14	-3.309812E+02	3.309812E+02	1.837315E-14
21.75000	3.000000	-1.372392E-14	-3.340784E+02	3.340784E+02	1.854508E-14
21.87500	3.000000	-1.364907E-14	-3.371604E+02	3.371604E+02	1.871616E-14
22.00000	3.000000	-1.359617E-14	-3.402301E+02	3.402301E+02	1.888657E-14
22.12500	3.000000	-1.352946E-14	-3.432851E+02	3.432851E+02	1.905615E-14
22.25000	3.000000	-1.347575E-14	-3.463261E+02	3.463261E+02	1.922496E-14
22.37500	3.000000	-1.340810E-14	-3.493533E+02	3.493533E+02	1.939301E-14
22.50000	3.000000	-1.335316E-14	-3.523650E+02	3.523650E+02	1.956019E-14
22.62500	3.000000	-1.327629E-14	-3.553635E+02	3.553635E+02	1.972664E-14
22.75000	3.000000	-1.320492E-14	-3.583474E+02	3.583474E+02	1.989227E-14
22.87500	3.000000	-1.314875E-14	-3.613167E+02	3.613167E+02	2.005710E-14
23.00000	3.000000	-1.307653E-14	-3.642710E+02	3.642710E+02	2.022110E-14
23.12500	3.000000	-1.301690E-14	-3.672090E+02	3.672090E+02	2.038419E-14
23.25000	3.000000	-1.294356E-14	-3.701331E+02	3.701331E+02	2.054651E-14
23.37500	3.000000	-1.285667E-14	-3.730382E+02	3.730382E+02	2.070778E-14
23.50000	3.000000	-1.279555E-14	-3.759301E+02	3.759301E+02	2.086831E-14
23.62500	3.000000	-1.271599E-14	-3.788048E+02	3.788048E+02	2.102789E-14
23.75000	3.000000	-1.265187E-14	-3.816630E+02	3.816630E+02	2.118655E-14
23.87500	3.000000	-1.257012E-14	-3.845046E+02	3.845046E+02	2.134429E-14
24.00000	3.000000	-1.250196E-14	-3.873268E+02	3.873268E+02	2.150096E-14
24.12500	3.000000	-1.240750E-14	-3.901320E+02	3.901320E+02	2.165668E-14
24.25000	3.000000	-1.231855E-14	-3.929197E+02	3.929197E+02	2.181143E-14
24.37500	3.000000	-1.224792E-14	-3.956890E+02	3.956890E+02	2.196515E-14
24.50000	3.000000	-1.215673E-14	-3.984393E+02	3.984393E+02	2.211782E-14
24.62500	3.000000	-1.208136E-14	-4.011690E+02	4.011690E+02	2.226935E-14
24.75000	3.000000	-1.198817E-14	-4.038813E+02	4.038813E+02	2.241991E-14
24.87500	3.000000	-1.187701E-14	-4.065687E+02	4.065687E+02	2.256910E-14
25.00000	3.000000	-1.179952E-14	-4.092400E+02	4.092400E+02	2.271738E-14
25.12500	3.000000	-1.169702E-14	-4.118895E+02	4.118895E+02	2.286446E-14
25.25000	3.000000	-1.161504E-14	-4.145168E+02	4.145168E+02	2.301030E-14
25.37500	3.000000	-1.150988E-14	-4.171229E+02	4.171229E+02	2.315497E-14
25.50000	3.000000	-1.142213E-14	-4.197042E+02	4.197042E+02	2.329826E-14
25.62500	3.000000	-1.131492E-14	-4.222660E+02	4.222660E+02	2.344047E-14
25.75000	3.000000	-1.118614E-14	-4.247999E+02	4.247999E+02	2.358113E-14
25.87500	3.000000	-1.109597E-14	-4.273133E+02	4.273133E+02	2.372065E-14
26.00000	3.000000	-1.097904E-14	-4.298020E+02	4.298020E+02	2.385881E-14
26.12500	3.000000	-1.088253E-14	-4.322645E+02	4.322645E+02	2.399550E-14
26.25000	3.000000	-1.076330E-14	-4.347043E+02	4.347043E+02	2.413093E-14
26.37500	3.000000	-1.066243E-14	-4.371141E+02	4.371141E+02	2.426471E-14
26.50000	3.000000	-1.052269E-14	-4.395001E+02	4.395001E+02	2.439716E-14
26.62500	3.000000	-1.039233E-14	-4.418597E+02	4.418597E+02	2.452814E-14
26.75000	3.000000	-1.028874E-14	-4.441916E+02	4.441916E+02	2.465759E-14
26.87500	3.000000	-1.015599E-14	-4.464962E+02	4.464962E+02	2.478552E-14
27.00000	3.000000	-1.004586E-14	-4.487700E+02	4.487700E+02	2.491174E-14
27.12500	3.000000	-9.910967E-15	-4.510188E+02	4.510188E+02	2.503658E-14
27.25000	3.000000	-9.750305E-15	-4.532330E+02	4.532330E+02	2.515949E-14

27.37500	3.000000	-9.637380E-15	-4.554216E+02	4.554216E+02	2.528098E-14
27.50000	3.000000	-9.491997E-15	-4.575790E+02	4.575790E+02	2.540074E-14
27.62500	3.000000	-9.374246E-15	-4.597051E+02	4.597051E+02	2.551876E-14
27.75000	3.000000	-9.225393E-15	-4.618011E+02	4.618011E+02	2.563511E-14
27.87500	3.000000	-9.101800E-15	-4.638615E+02	4.638615E+02	2.574949E-14
28.00000	3.000000	-8.929953E-15	-4.658926E+02	4.658926E+02	2.586224E-14
28.12500	3.000000	-8.771304E-15	-4.678907E+02	4.678907E+02	2.597315E-14
28.25000	3.000000	-8.644642E-15	-4.698556E+02	4.698556E+02	2.608223E-14
28.37500	3.000000	-8.483501E-15	-4.717868E+02	4.717868E+02	2.618943E-14
28.50000	3.000000	-8.350985E-15	-4.736812E+02	4.736812E+02	2.629459E-14
28.62500	3.000000	-8.187694E-15	-4.755448E+02	4.755448E+02	2.639804E-14
28.75000	3.000000	-7.995817E-15	-4.773673E+02	4.773673E+02	2.649921E-14
28.87500	3.000000	-7.860813E-15	-4.791595E+02	4.791595E+02	2.659869E-14
29.00000	3.000000	-7.687820E-15	-4.809138E+02	4.809138E+02	2.669608E-14
29.12500	3.000000	-7.548121E-15	-4.826313E+02	4.826313E+02	2.679142E-14
29.25000	3.000000	-7.371980E-15	-4.843127E+02	4.843127E+02	2.688476E-14
29.37500	3.000000	-7.227094E-15	-4.859528E+02	4.859528E+02	2.697580E-14
29.50000	3.000000	-7.024873E-15	-4.875582E+02	4.875582E+02	2.706492E-14
29.62500	3.000000	-6.840400E-15	-4.891243E+02	4.891243E+02	2.715185E-14
29.75000	3.000000	-6.692904E-15	-4.906526E+02	4.906526E+02	2.723669E-14
29.87500	3.000000	-6.505867E-15	-4.921412E+02	4.921412E+02	2.731932E-14
30.00000	3.000000	-6.353336E-15	-4.935878E+02	4.935878E+02	2.739963E-14
30.12500	3.000000	-6.164789E-15	-4.949981E+02	4.949981E+02	2.747791E-14
30.25000	3.000000	-5.945746E-15	-4.963618E+02	4.963618E+02	2.755361E-14

Button D, Vertical Offset = 10mm

Los Alamos National Laboratory Poisson Superfish
Program SF7 written by James H. Billen and Lloyd M. Young

The original Poisson Superfish codes were developed by
Ron F. Holsinger in collaboration with Klaus Halbach.
These programs are provided as a service to the accelerator
community by the Los Alamos Accelerator Code Group (LAACG).

Program SF7 6.10 released 7-18-2001

SF.INI file: H:\LANL\SF.INI 8-03-2001 14:32:36
Starting from file BPM.T35 dump 1.
Memory used for BPM.T35 arrays: 1.579 M
Reading keyword commands and data from file:
BUTTON4.TXT.

Electric fields along a straight line with end points at:
(X1, Y1) = (37.75000, 3.00000)
(X2, Y2) = (50.25000, 3.00000)
Number of increments: 100

X (mm)	Y (mm)	Ex (V/cm)	Ey (V/cm)	|E| (V/cm)	V (V)
37.75000	3.000000	5.946806E-15	-4.963507E+02	4.963507E+02	2.755300E-14
37.87500	3.000000	6.166021E-15	-4.949867E+02	4.949867E+02	2.747728E-14
38.00000	3.000000	6.354706E-15	-4.935761E+02	4.935761E+02	2.739898E-14
38.12500	3.000000	6.506854E-15	-4.921290E+02	4.921290E+02	2.731865E-14
38.25000	3.000000	6.693867E-15	-4.906402E+02	4.906402E+02	2.723600E-14
38.37500	3.000000	6.841103E-15	-4.891113E+02	4.891113E+02	2.715113E-14
38.50000	3.000000	7.025472E-15	-4.875452E+02	4.875452E+02	2.706419E-14
38.62500	3.000000	7.227899E-15	-4.859396E+02	4.859396E+02	2.697506E-14
38.75000	3.000000	7.372696E-15	-4.842991E+02	4.842991E+02	2.688400E-14
38.87500	3.000000	7.549006E-15	-4.826175E+02	4.826175E+02	2.679065E-14
39.00000	3.000000	7.688567E-15	-4.808994E+02	4.808994E+02	2.669528E-14
39.12500	3.000000	7.861608E-15	-4.791448E+02	4.791448E+02	2.659788E-14
39.25000	3.000000	7.996582E-15	-4.773520E+02	4.773520E+02	2.649836E-14
39.37500	3.000000	8.188438E-15	-4.755294E+02	4.755294E+02	2.639719E-14
39.50000	3.000000	8.351913E-15	-4.736657E+02	4.736657E+02	2.629373E-14
39.62500	3.000000	8.484216E-15	-4.717706E+02	4.717706E+02	2.618853E-14
39.75000	3.000000	8.645428E-15	-4.698392E+02	4.698392E+02	2.608131E-14
39.87500	3.000000	8.771699E-15	-4.678736E+02	4.678736E+02	2.597220E-14
40.00000	3.000000	8.930250E-15	-4.658756E+02	4.658756E+02	2.586129E-14
40.12500	3.000000	9.102425E-15	-4.638444E+02	4.638444E+02	2.574854E-14
40.25000	3.000000	9.225808E-15	-4.617835E+02	4.617835E+02	2.563413E-14
40.37500	3.000000	9.374843E-15	-4.596873E+02	4.596873E+02	2.551777E-14
40.50000	3.000000	9.492588E-15	-4.575606E+02	4.575606E+02	2.539971E-14
40.62500	3.000000	9.637968E-15	-4.554030E+02	4.554030E+02	2.527994E-14
40.75000	3.000000	9.750672E-15	-4.532136E+02	4.532136E+02	2.515841E-14
40.87500	3.000000	9.911294E-15	-4.509994E+02	4.509994E+02	2.503550E-14
41.00000	3.000000	1.004658E-14	-4.487505E+02	4.487505E+02	2.491066E-14
41.12500	3.000000	1.015632E-14	-4.464761E+02	4.464761E+02	2.478440E-14
41.25000	3.000000	1.028923E-14	-4.441713E+02	4.441713E+02	2.465646E-14
41.37500	3.000000	1.039280E-14	-4.418388E+02	4.418388E+02	2.452698E-14
41.50000	3.000000	1.052294E-14	-4.394792E+02	4.394792E+02	2.439600E-14
41.62500	3.000000	1.066308E-14	-4.370931E+02	4.370931E+02	2.426354E-14
41.75000	3.000000	1.076377E-14	-4.346825E+02	4.346825E+02	2.412973E-14
41.87500	3.000000	1.088323E-14	-4.322425E+02	4.322425E+02	2.399428E-14
42.00000	3.000000	1.097927E-14	-4.297793E+02	4.297793E+02	2.385754E-14
42.12500	3.000000	1.109634E-14	-4.272906E+02	4.272906E+02	2.371939E-14
42.25000	3.000000	1.118660E-14	-4.247765E+02	4.247765E+02	2.357983E-14
42.37500	3.000000	1.131545E-14	-4.222425E+02	4.222425E+02	2.343917E-14
42.50000	3.000000	1.142277E-14	-4.196805E+02	4.196805E+02	2.329695E-14
42.62500	3.000000	1.151014E-14	-4.170985E+02	4.170985E+02	2.315362E-14
42.75000	3.000000	1.161543E-14	-4.144923E+02	4.144923E+02	2.300894E-14
42.87500	3.000000	1.169707E-14	-4.118643E+02	4.118643E+02	2.286306E-14
43.00000	3.000000	1.179976E-14	-4.092148E+02	4.092148E+02	2.271598E-14
43.12500	3.000000	1.187764E-14	-4.065430E+02	4.065430E+02	2.256767E-14
43.25000	3.000000	1.198883E-14	-4.038554E+02	4.038554E+02	2.241848E-14
43.37500	3.000000	1.208215E-14	-4.011429E+02	4.011429E+02	2.226791E-14
43.50000	3.000000	1.215732E-14	-3.984125E+02	3.984125E+02	2.211634E-14
43.62500	3.000000	1.224867E-14	-3.956620E+02	3.956620E+02	2.196365E-14
43.75000	3.000000	1.231895E-14	-3.928919E+02	3.928919E+02	2.180988E-14

43.87500	3.000000	1.241940E-14	-3.901061E+02	3.901061E+02	2.165524E-14
44.00000	3.000000	1.250290E-14	-3.872987E+02	3.872987E+02	2.149940E-14
44.12500	3.000000	1.257079E-14	-3.844758E+02	3.844758E+02	2.134269E-14
44.25000	3.000000	1.265279E-14	-3.816341E+02	3.816341E+02	2.118495E-14
44.37500	3.000000	1.271649E-14	-3.787755E+02	3.787755E+02	2.102626E-14
44.50000	3.000000	1.279639E-14	-3.759001E+02	3.759001E+02	2.086665E-14
44.62500	3.000000	1.285725E-14	-3.730073E+02	3.730073E+02	2.070607E-14
44.75000	3.000000	1.294421E-14	-3.701020E+02	3.701020E+02	2.054479E-14
44.87500	3.000000	1.301792E-14	-3.671777E+02	3.671777E+02	2.038245E-14
45.00000	3.000000	1.307694E-14	-3.642390E+02	3.642390E+02	2.021932E-14
45.12500	3.000000	1.314932E-14	-3.612846E+02	3.612846E+02	2.005532E-14
45.25000	3.000000	1.320555E-14	-3.583146E+02	3.583146E+02	1.989046E-14
45.37500	3.000000	1.327657E-14	-3.553307E+02	3.553307E+02	1.972482E-14
45.50000	3.000000	1.335404E-14	-3.523322E+02	3.523322E+02	1.955836E-14
45.62500	3.000000	1.340899E-14	-3.493196E+02	3.493196E+02	1.939114E-14
45.75000	3.000000	1.347672E-14	-3.462920E+02	3.462920E+02	1.922307E-14
45.87500	3.000000	1.353012E-14	-3.432502E+02	3.432502E+02	1.905421E-14
46.00000	3.000000	1.359697E-14	-3.401950E+02	3.401950E+02	1.888462E-14
46.12500	3.000000	1.364972E-14	-3.371245E+02	3.371245E+02	1.871417E-14
46.25000	3.000000	1.372443E-14	-3.340424E+02	3.340424E+02	1.854308E-14
46.37500	3.000000	1.379078E-14	-3.309452E+02	3.309452E+02	1.837115E-14
46.50000	3.000000	1.384328E-14	-3.278345E+02	3.278345E+02	1.819847E-14
46.62500	3.000000	1.390981E-14	-3.247101E+02	3.247101E+02	1.802503E-14
46.75000	3.000000	1.396321E-14	-3.215708E+02	3.215708E+02	1.785076E-14
46.87500	3.000000	1.403000E-14	-3.184195E+02	3.184195E+02	1.767583E-14
47.00000	3.000000	1.410850E-14	-3.152517E+02	3.152517E+02	1.749998E-14
47.12500	3.000000	1.416268E-14	-3.120711E+02	3.120711E+02	1.732343E-14
47.25000	3.000000	1.423386E-14	-3.088761E+02	3.088761E+02	1.714607E-14
47.37500	3.000000	1.429110E-14	-3.056657E+02	3.056657E+02	1.696785E-14
47.50000	3.000000	1.436476E-14	-3.024414E+02	3.024414E+02	1.678887E-14
47.62500	3.000000	1.442677E-14	-2.991990E+02	2.991990E+02	1.660888E-14
47.75000	3.000000	1.451309E-14	-2.959414E+02	2.959414E+02	1.642805E-14
47.87500	3.000000	1.459788E-14	-2.926693E+02	2.926693E+02	1.624641E-14
48.00000	3.000000	1.466269E-14	-2.893783E+02	2.893783E+02	1.606372E-14
48.12500	3.000000	1.475123E-14	-2.860716E+02	2.860716E+02	1.588016E-14
48.25000	3.000000	1.482645E-14	-2.827433E+02	2.827433E+02	1.569540E-14
48.37500	3.000000	1.491885E-14	-2.794008E+02	2.794008E+02	1.550986E-14
48.50000	3.000000	1.504091E-14	-2.760295E+02	2.760295E+02	1.532272E-14
48.62500	3.000000	1.512126E-14	-2.726414E+02	2.726414E+02	1.513464E-14
48.75000	3.000000	1.523846E-14	-2.692326E+02	2.692326E+02	1.494541E-14
48.87500	3.000000	1.533421E-14	-2.657982E+02	2.657982E+02	1.475477E-14
49.00000	3.000000	1.546348E-14	-2.623417E+02	2.623417E+02	1.456289E-14
49.12500	3.000000	1.558053E-14	-2.588510E+02	2.588510E+02	1.436912E-14
49.25000	3.000000	1.574082E-14	-2.553274E+02	2.553274E+02	1.417352E-14
49.37500	3.000000	1.592062E-14	-2.517856E+02	2.517856E+02	1.397691E-14
49.50000	3.000000	1.605005E-14	-2.482003E+02	2.482003E+02	1.377789E-14
49.62500	3.000000	1.624696E-14	-2.445866E+02	2.445866E+02	1.357728E-14
49.75000	3.000000	1.642279E-14	-2.409229E+02	2.409229E+02	1.337391E-14
49.87500	3.000000	1.663930E-14	-2.372350E+02	2.372350E+02	1.316919E-14
50.00000	3.000000	1.697259E-14	-2.334630E+02	2.334630E+02	1.295980E-14
50.12500	3.000000	1.717026E-14	-2.296544E+02	2.296544E+02	1.274838E-14
50.25000	3.000000	1.758185E-14	-2.258296E+02	2.258296E+02	1.253606E-14